



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

L VOC 1816. S



**Harvard College Library**

FROM

*The Society*





- 100 1016. v



**Harvard College Library**

FROM

*The Society*









①

PROCEEDINGS  
OF THE  
LITERARY AND PHILOSOPHICAL SOCIETY  
OF  
LIVERPOOL, Eng. — ^  
DURING THE  
SIXTY-FIFTH SESSION, 1875-76.

No. XXX.



£ LONDON:  
LONGMANS, GREEN, READER, & DYER.  
LIVERPOOL:  
D. MARPLES & CO., LIMITED, LORD STREET.

1876.



©

# PROCEEDINGS

OF THE

## LITERARY AND PHILOSOPHICAL SOCIETY

OF

### LIVERPOOL, Eng. — A

DURING THE

SIXTY-FIFTH SESSION, 1875-76.

No. XXX.



LONDON:  
LONGMANS, GREEN, READER, & DYER.  
LIVERPOOL:  
D. MARPLES & CO., LIMITED, LORD STREET.

1876.

~~1877~~

L SOC 1816.5

1877. Mar. 20,

Given  
The Society.

This Volume has been edited by the Honorary Secretary.

The Authors have revised their Papers.

The Authors alone are responsible for facts and opinions.

The Society exchanges Proceedings with other publishing bodies, through the Librarian, from whom back numbers may be obtained.

31-214  
19-7

## CONTENTS.

---

	PAGE
COUNCIL .....	vii
LIST OF MEMBERS .....	viii
HONORARY MEMBERS .....	xix
CORRESPONDING MEMBERS .....	xxi
ASSOCIATES .....	xxii
DONATIONS TO THE LIBRARY .....	xxiii
LIST OF SOCIETIES, ETC., TO WHICH THIS VOLUME IS PRESENTED .....	xxxix
BALANCE SHEET .....	xliii
ANNUAL MEETING—REPORT .....	xliv
ELECTION OF COUNCIL.	
RE-ELECTION OF ASSOCIATES.	
PRESIDENT'S INAUGURAL ADDRESS ON THE TENDENCIES AND THE FUTURE OF MODERN CIVILISATION.	
FIRST ORDINARY MEETING .....	xlix
Notes and Communications on the following objects exhibited :—	
Luffaria Archeri, Halichondria birotulata, and other Sponges, by Mr. THOS. HIGGIN.	
An Orthoceras from the Millstone Grit of Sweeney Mountain, near Oswestry, by Mr. G. H. MORTON, F.G.S.	
A Collection of Shells of the Genus Oliva, by Mr. F. P. MARRAT.	
Tusk of the Siberian Mammoth ; Egg-sacs and Spawn of various Molluscs ; Skulls and Bones of Pouched	

PAGE	
Rats ; Specimens of rare fish, allied to Spinola's Deal Fish, and of Balani and Mangrove Oysters ; Sample of the Fossil Fish, <i>Dapedius punctatus</i> ; all by Mr. T. J. MOORE, Cor. Mem. Z.S.	lxxv
Our Social Wasps, and on a Specimen of <i>Polistes</i> taken at Ince Blundell, by the Rev. H. H. HIGGINS, M.A.	lxxvi
<b>SECOND ORDINARY MEETING .....</b>	<b>lxvi</b>
Magneto-electric Machine, exhibited by Dr. CAMPBELL-BROWN.	
Specimen of Eucalyptus, exhibited by Dr. CARTER.	
Notice of a Poem, by Mr. Brooke, on "Liverpool," published in 1820, by Mr. J. A. PICTON, F.S.A.	
Dr. CAMPBELL-BROWN on "Electricity compared with Heat, as a source of Motive Power."	
<b>THIRD ORDINARY MEETING .....</b>	<b>lxix</b>
Fossil Corals, from the Carboniferous Limestone of North Wales, by Mr. G. H. MORTON, F.G.S.	
Skeleton of the <i>Dinornis Elephantopus</i> , by Mr. T. J. MOORE, Cor. Mem. Z.S.	
<b>FOURTH ORDINARY MEETING .....</b>	<b>lxxi</b>
Mr. E. R. RUSSELL on "The True Macbeth."	
<b>FIFTH ORDINARY MEETING .....</b>	<b>lxviii</b>
Mr. JAMES A. PICTON, F.S.A., on "The House of Stanley, and the Origin of its Legend of the Eagle and Child."	
Dr. INMAN "On a means employed for Removing and Erecting Menhirs."	
<b>SIXTH ORDINARY MEETING .....</b>	<b>lxviii</b>
Mr. ALFRED MORGAN, "A few Notes on the Khāsi Hill Tribes, and the Geology of the Shillong Plateau."	
Mr. JOSEPH BOULT, "Gleanings from the Early History of Liverpool."	

## CONTENTS.

iii

	PAGE
<b>SEVENTH ORDINARY MEETING .....</b>	<b>lxxiii</b>
Note on the Radiometer, exhibited by Mr. R. C. JOHNSON, F.R.A.S.	
Skeletons of two species of the Apteryx, &c., exhibited by Mr. T. J. MOORE, Cor. Mem. Z.S.	
Oxy-Hydrogen Exhibition of the Gems of Ancient and Modern Statuary, by Dr. RICKARD.	
<b>EIGHTH ORDINARY MEETING .....</b>	<b>lxxv</b>
Mr. J. NEWBY HETHERINGTON, on "Repetition and Reduplication in Language."	
<b>NINTH ORDINARY MEETING .....</b>	<b>lxxvi</b>
Facsimile of the Ardagh Chalice, exhibited by Mr. J. A. PICTON, F.S.A.	
Note on the Relation of Flowers to Insects, by Mr. A. MORGAN.	
Mr. THOMAS WARD, on "Salt, and its Export from the Ports of the Mersey."	
<b>TENTH ORDINARY MEETING.....</b>	<b>lxxix</b>
Mr. J. LINTON PALMER, on "Some Tablets found in Easter Island."	
Mr. ALFRED LUTSCHAUMIG, on "Method in Creation."	
<b>ELEVENTH ORDINARY MEETING .....</b>	<b>lxxix</b>
Rev. T. P. KIRKMAN, on "The Janal 14-Aoral 14-Edra."	
Mr. BARON LOUIS BENAS, on "The Men who have influenced Modern German Thought."	
<b>TWELFTH ORDINARY MEETING.....</b>	<b>lxxx</b>
Mr. W. T. BLACK, on "The Partridges of South Africa, and Partridge Shooting in the Great Winterberg District."	
Dr. NICHOLSON, on "Indian Snakes."	
Specimens of <i>Luffaria</i> , exhibited by Capt. J. A. PERRY.	

	PAGE
Note on the Trinotion and other Parasites which infest the Pelican, by Capt. J. A. PERRY.	
THIRTEENTH ORDINARY MEETING .....	lxxxi
Mr. A. E. NEVINS, on "A Method of Correcting the Rate of a Marine Chronometer for Changes of Temperature."	
Specimens of Variegated Marble, from Numidia, ex- hibited by Mr. J. A. PIOTON, F.S.A.	
Specimen of Flexible Sandstone, exhibited by Mr. A. MORGAN.	
Notes on objects exhibited by Mr. T. J. MOORE, Cor. Mem. Z.S. :—Specimens of the Himalayan Ibex ; of the Warryato or Neilgherry Ibex ; Head and Horns of the Chiru, or Hodgson's Antelope ; Head and Horns of the Oorial and the Burhel ; a large Flying Squirrel, from Kashmir, a Thibet Marmot ; Skulls, &c., of Voles, the Musk Shrew, the Susu, &c. ; a rare Siluroid Fish, genus Plecostomus, from Uruguay ; Curiosities from Western Africa ; also, a Note on a Cetacean ( <i>Orca Gladiator</i> ), stranded on the Cheshire Coast.	
Mr. RICHMOND LEIGH, on "Vegetation and Climate."	

## PAPERS PRINTED.

	PAGE
Mr. JAMES A. PIOTON, F.S.A.—President's Address—"The Tendencies and the Future of Modern Civilisation" ...	1
Mr. EDWARD R. RUSSELL.—"The True Macbeth" .....	41
Mr. J. CAMPBELL-BROWN, D.Sc., etc.—"On Electricity compared with Heat as a source of Mechanical Power"	98
Mr. THOMAS INMAN, M.D.—"On a means employed for removing and erecting Menhirs".....	108

## CONTENTS.

v

	PAGE
Mr. ALFRED MORGAN.—“On the Khāsi Hill Tribes of North-eastern Bengal, and on the Geology of the Shillong Plateau” .....	115
Mr. J. NEWBY HETHERINGTON.—“On Repetition and Reduplication in Language” .....	129
Mr. JOSEPH BOULT, F.R.I.B.A.—“Gleanings in the Early History of Liverpool and the Neighbourhood” .....	158
Mr. THOMAS WARD.—“Salt, and its Export from the Ports of the Mersey” .....	188
Mr. EDWARD NICHOLSON, F.C.S.—“On Indian Snakes” ...	211
Mr. ALFRED MORGAN.—“A Note on Itacolumyte, or Flexible Sandstone” .....	228
Mr. ARTHUR EDWARD NEVINS.—“On the Method of correcting the rate of a Marine Chronometer for changes of Temperature, according to Mr. Hartnup’s Laws, with Tables and explanations for facilitating the computation of the same corrections” .....	227
Mr. BARON LOUIS BENAS.—“On the Men who have influenced Modern German Thought” ... .....	235
Mr. J. LINTON PALMER, F.S.A., F.R.G.S., R.N.—“On some Tablets found in Easter Island” .....	255
Mr. JAMES A. PIOTON, F.S.A.—“The House of Stanley and the Legend of the Eagle and Child” .....	265
Rev. THOMAS P. KIRKMAN, M.A., F.R.S.—“The Janal 14-Acral 14-Edra” .....	271
Mr. RICHMOND LEIGH, M.R.C.S.E.—“Vegetation and Climate” .....	279
Mr. W. T. BLACK, SURGEON-MAJOR.—“Natural History of the Greywing and Redwing Partridges of South Africa”	297



**SESSION LXV., 1875-76.**

---

*President.*

**JAMES ALLANSON PICTON, F.S.A.**

*Ex-Presidents.*

<b>Rev. JAMES MARTINEAU, LL.D.</b>	<b>Rev. G. D. GINSBURG, LL.D.</b>
<b>Rev. J. BOOTH, LL.D.</b>	<b>JOHN BIRKEBECK NEVINS, M.D.</b>
<b>Rev. H. H. HIGGINS, M.A.</b>	<b>ALBERT JULIUS MOTTE.</b>
<b>WILLIAM IRVINE, Ph.D.</b>	

*Vice-Presidents.*

<b>ALFRED HIGGINSON, M.R.C.S.</b>
<b>THOS. J. MOORE, COR. MEM. Z.S.L.</b>
<b>JOHN J. DEDDYE, M.D., M.R.C.S.</b>

*Honorary Treasurer.*

**RICHARD C. JOHNSON, F.R.A.S.**

*Honorary Secretary.*

**JAMES BIRCHALL.**

*Honorary Librarian.*

**ALFRED MORGAN.**

*Council.*

<b>J. CAMPBELL BROWN, D.Sc., &amp;c.</b>	<b>GEORGE H. MORTON, F.G.S.</b>
<b>ALFRED E. FLETCHER, F.C.S.</b>	<b>REV. JACOB PRAG.</b>
<b>W. CARTER, M.B.</b>	<b>BARON LOUIS BENAS.</b>
<b>REV. E. M. GELDART, M.A.</b>	<b>JAMES BIRCH.</b>
<b>EDWARD R. RUSSELL.</b>	<b>J. NEWBY HETHERINGTON.</b>
<b>EDWARD DAVIES, F.C.S.</b>	<b>REV. J. ALDEN DAVIES.</b>
<b>C. H. STEARN.</b>	<b>JAMES SMITH.</b>

## ORDINARY MEMBERS,

ON THE SOCIETY'S ROLL AT THE CLOSE OF THE 65TH SESSION,

CORRECTED TO JUNE, 1876.

*Life Members are marked with an Asterisk.*

- Oct. 21, 1872 Abbott, Joseph, B.A., 10, Sandown-terrace,  
Wavertree-road, and Liverpool College, Shaw-  
street, Everton.
- Oct. 11, 1888 Aikin, James, 4, Gambier-terrace.
- Nov. 4, 1867 Allen, John Fenwick, Peaseley Vale, St. Helens.
- March 7, 1864 Archer, F., B.A. Trin. Col. Cantab., Boundary  
Cottage, Little Crosby.
- \*Nov. 28, 1858 Archer, T. C., F.R.S.E., F.R.S.S.A., Director of  
the Industrial Museum, Edinburgh.
- Dec. 14, 1868 Ashe, Theop. Fielding, 9-15, Atherton-street.
- Feb. 22, 1855 Avison, Thomas, F.S.A., 18, Cook-street, and  
Fullwood Park, Aigburth.
- Jan. 11, 1864 Bagshaw, John, 87, Church-street, and 26, Bent-  
ley-road, Prince's Park.
- May 4, 1868 Bailey, Fras. J., M.R.C.S., 51, Grove-street.
- March 28, 1874 Barclay, W., 5, Scottish Chambers, 48, Castle-  
street, and 6, Montpelier-crescent, New Brighton.
- Dec. 18, 1875 Barnes, James, Litherland Park.
- April 20, 1874 Barton, Rev. John, M.A., Vicarage, Rainhill.
- Nov. 15, 1869 Beer, Joseph B. de, Northern Assurance Chambers,  
Tithebarn-street.
- March 9, 1857 Bell, Christopher, Redcross-street, and 55, Hamil-  
ton-square, Birkenhead.
- Jan. 11, 1875 Bell, Wilson, 1, Laburnum Villas, Egerton-street,  
New Brighton.

- Feb. 22, 1875 Bellew, Thomas A., *Cunard Mail Office*, 8, Water-street.
- Nov. 15, 1875 Bellis, William, 8, *Sandown-terrace*, Wavertree.
- Dec. 10, 1866 Benas, Baron Louis, 5, *South Castle-street*.
- Nov. 27, 1865 Biggs, Arthur Worthington, 28, *Exchange Street East*, and 11, *Percy-street*.
- Feb. 6, 1872 Biggs, John H. W., 6, *Windsor-buildings*, George-street.
- Oct. 31, 1859 Birch, Jas. (Messrs. Reiss Brothers), *The Temple, Dale-street*.
- Jan. 25, 1864 Birchall, James, Governor of the Liverpool Industrial Schools, *Kirkdale*, HON. SECRETARY.
- Dec. 14, 1874 Black, Rev. R., M.A., 26, *Falkner-street*.
- March 9, 1866 Blood, William, *Chamber of Commerce*, and *Greta Mount*, 5, *Woodchurch-road*, Birkenhead.
- Nov. 26, 1866 Boult, Joseph, 15D, *Exchange-buildings*, W.
- Oct. 19, 1868 Bower, Anthony, *Vauxhall Foundry*, and *Bowersdale*, Seaforth.
- Oct. 21, 1872 Bowring, C. T., *Elmsleigh*, *Prince's Park*, and 20, *Lancaster-buildings*, *Tithebarn-street*.
- Dec. 15, 1878 Brass, Joseph, M.D., 6, *Upper Parliament-street*.
- Nov. 4, 1867 Bramwell, Ed., *Cowley Hill*, St. Helens.
- Jan. 27, 1878 Bremner, H. H., 15, *Lord-street*.
- Nov. 12, 1866 Browne, Edgar A., 86, *Bedford-street South*.
- Oct. 18, 1869 Brown, J. Campbell, D.Sc., F.C.S., *School of Medicine*, *Dover-street*.
- Feb. 4, 1867 Burden, Edward, 128, *Upper Parliament-street*.
- Nov. 12, 1866 Butler, Rev. George, *The College*, *Shaw-street*.
- April 18, 1864 Burne, Joseph, *Royal Insurance Office*, 1, *North John-street*, and *Higher Tranmere*.
- \*May 1, 1848 Byerley, Isaac, F.L.S., F.R.C.S., *Victoria-road*, *Seacombe*.
- Nov. 3, 1862 Cameron, John, M.D., M.R.C.P., Physician to the Southern Hospital, and Lecturer on Medicine at the Royal Infirmary School of Medicine, 17, *Rodney-street*.

## ORDINARY MEMBERS.

- Dec. 2, 1872 Carey, Eustace, *Appleton-in-Widnes, near Warrington.*
- Jan. 9, 1865 Cariss, Astrup, 40, *Castle-street.*
- Mar. 4, 1872 Carter, W., M.B. Lond., 74, *Rodney-street.*
- Dec. 2, 1861 Chadburn, William, 71, *Lord-street.*
- April 8, 1876 Chantrell, G. F., 1, *St. James's Mount.*
- Feb. 22, 1875 Chapman, Thomas, *Oaklynne, Parkfield-road, Prince's Park.*
- Oct. 18, 1869 Cook, Henry James, *Byrom-street, and Burbo House, Blundell Sands.*
- Dec. 18, 1875 Cowell, Peter, *Free Library, William Brown-street.*
- Oct. 6, 1868 Crosfield, William, Jun., 28, *Temple Court, and Alexandra-drive, Ullet-road.*
- Dec. 14, 1868 Daly, Dennis, 11, *Rumford-street.*
- Nov. 12, 1866 Davies, E., F.C.S., *The Laboratory, Royal Institution, Colquitt-street.*
- Nov. 2, 1868 Dawbarn, William, *The Temple, Dale-street, and Mossley-hill.*
- Oct. 20, 1878 Day, George, 28, *Brunswick-street, and Abbey Cottage, Aintree.*
- Oct. 1, 1866 Dawson, Thomas, 26, *Rodney-street.*
- April 6, 1874 Dodd, John, 6, *Thomas-street, and 2, Derby-terrace, Rock Ferry.*
- Nov. 27, 1868 Dove, John M., *Claughton.*
- Nov. 1, 1875 Doyle, Jas. F., 4, *Harrington-street, and Merton-road, Bootle.*
- Jan. 28, 1848 Drysdale, John James, M.D. Edin., M.R.C.S. Edin., 86, *Rodney-street.*
- Feb. 4, 1856 Duckworth, Henry, F.L.S., F.R.G.S., F.G.S., 82, *Brown's-buildings, Exchange-street, W.*
- Nov. 1, 1875 Edmunds, William, *Edmond-street Chambers, Edmond-street.*
- \*Nov. 27, 1848 Edwards, J. B., Ph.D.Gies, F.C.S., Professor Medical Faculty of Bishop's College, *Montreal.*
- Mar. 21, 1870 Edwards, Edward E. (Smith, Edwards & Co.), *Adelaide-buildings, 4, Chapel-street.*

- Feb. 24, 1868 Elliot, John, 85, *Peter's-lane*.  
April 7, 1862 English, Charles J., 26, *Chapel-street*, and 26, *Falkner-square*.  
April 20, 1874 English, Robert A., 26, *Falkner-square*.  
\*Dec. 18, 1852 Ferguson, William, F.L.S., F.G.S., *Kinmundy House*, near Mintlaw, N.B.  
Feb. 9, 1868 Finlay, Wm., Senior Mathematical Master, Middle School, *Liverpool College*, and 810, *Shaw-street*.  
Oct. 1, 1866 Fletcher, Alfred E., F.C.S., H.M. Inspector of Alkali Works for the Western District, 21, *Overton-street, Edge-hill*.  
Nov. 15, 1875 Fleming, E. L., F.C.S., *Borax Works, Old Swan*.  
\*Mar. 19, 1855 Ford, James Thomas, 5, *Essex-ct., Temple, E.C.*  
Dec. 2, 1872 Forwood, Wm. Bower (Messrs. Leech, Harrison & Forwood), 16, *Queen-buildings*, 11, *Dale-street* and *Burbo Bank-road, Blundell Sands*.  
Nov. 16, 1874 Fothergill, Charles George, *Gambier-terrace*.  
Jan. 12, 1874 Frost, John Pownall, 10, *North John-street*.  
Nov. 29, 1875 Gardner, William, *Ash Lea, Oak-hill Park*.  
\*Feb. 6, 1854 Gee, Robert, M.D. Heidelb., M.R.C.P., Lecturer on Diseases of Children, Royal Infirmary School of Medicine; Physician, Workhouse Hospital, 5, *Abercromby-square*.  
Nov. 8, 1878 Geldart, Rev. E. M., M.A., 8, *Wellfield-place, Peel-street*.  
Dec. 14, 1874 Greaves, Leycester H., *Apsley Villa, Wellington-road, Wavertree*.  
Nov. 14, 1858 Greenwood, Henry, 82, *Castle-street*, and *Stanley Park*.  
Nov. 16, 1874 Grindley, Benjamin H., 28, *Seel-street*.  
Dec. 15, 1878 Grisewood, William, *Queen-street, Liscard*.  
Dec. 14, 1874 Gunn, Rev. W. E. B., M.A., 8, *Blackburne-terrace, Blackburne-place*.  
Nov. 16, 1874 Guthrie, Malcolm, 81, *Stanley-road, Bootle*.  
Jan. 22, 1855 Hakes, James, M.R.C.S., Surgeon to the Northern Hospital, 80, *Hope-street*.

- Oct. 18, 1875 Hale, Philip A., Bank of England, *Castle-street*.  
 Oct. 21, 1872 Halliwell, Joseph, 10, *College-lane*.  
 \*Jan. 21, 1856 Hardman, Lawrence, 85, *Rock Park, Rock Ferry*.  
 Dec. 18, 1875 Harpin, E., 46, *Onslow-road, Elm Park, Fairfield*.  
 Nov. 15, 1869 Hartwig, Estevan H. L., 62, *Palmaile, Antona, Hamburg*.  
 Nov. 80, 1874 Harvey, Henry, M.B., *High-street, Wavertree*.  
 Feb. 6, 1865 Hassan, Rev. E., *Alma-terrace, Sandown-lane*.  
 Nov. 18, 1865 Hayward, John Williams, M.D., 117, *Grono-street*.  
 Feb. 6, 1865 Hebson, Douglas, 18, *Tower Chambers*, and 58, *Bedford-street South*.  
 Oct. 19, 1874 Hetherington, J. Newby, 57, *Canning-street*.  
 Nov. 4, 1872 Hicks, Sibley, F.R.C.S., 2, *Erskine-street*.  
 Dec. 28, 1846 Higgins, Rev. H. H., M.A. Cantab., F.C.P.S., *Rainhill, Ex-PRESIDENT*.  
 \*Oct. 81, 1886 Higginson, Alfred, M.R.C.S., Surgeon Royal Southern Hospital, 44, *Upper Parliament-street*, *VICE-PRESIDENT*.  
 Mar. 22, 1869 Higgin, Thomas, 88, *Tower-buildings*, and *Huyton*.  
 Nov. 16, 1868 Holden, Adam, 48, *Church-street*, and 2, *Carlton-terrace, Milton-road*.  
 March 9, 1868 Holme, James, 10, *Huskisson-street*.  
 Nov. 80, 1874 Holme, Rev. Arthur P., *Tattenhall, near Chester*.  
 \*Dec. 14, 1862 Holt, Robert Durning, 6, *India-buildings*, and 29, *Edge-lane*.  
 Jan. 24, 1876 Hughes, Lewis, 88, *St. Domingo Vale, Everton*.  
 \*Nov. 18, 1854 Hunter, John, Member Historic Society, Pennsylvania, *Halifax, Nova Scotia*.  
 Dec. 18, 1875 Hutchinson, Joseph B., M.R.C.S., 77, *Upper Parliament-street*.  
 Dec. 15, 1878 Hutton, Henry, *Baltic-buildings, Redcross-street*.  
 Jan. 26, 1857 Hutton, David, 8, *St. George's-crescent*, and 61, *Canning-street*.  
 \*April 29, 1850 Ihne, William, Ph.D., Bonn, *Villa Felseck, Heidelberg, Ex-PRESIDENT*.

- Feb. 28, 1857 Imlach, Henry, M.D. Edin., 1, *Abercromby-square*.
- Oct. 19, 1874 Imlach, Francis, M.B., 1, *Abercromby-square*.
- Nov. 28, 1864 Jeffrey, F. J.
- Oct. 20, 1878 Johnson, Digby, Royal Insurance Office, *North John-street*.
- Mar. 10, 1862 Johnson, Richard, *Queen-buildings*, and *Blundell Sands*.
- Jan. 26, 1868 Johnson, Richard C., F.R.A.S., *Queen-buildings* and *Blundell Sands*, HON. TREASURER.
- Feb. 24, 1868 Jones, Charles W., 8, *Childwall-road, Wavertree*.
- \*April 4, 1852 Jones, Morris Charles, F.S.A., F.S.A.Scot., 20, *Abercromby-square*.
- Oct. 18, 1869 Jones, Wm. Bolton, 21, *South Castle-street*.
- Nov. 30, 1874 Joseph, Rev. Morris, 67, *Canning-street*.
- Oct. 2, 1865 Kendal, Robinson, 16, *Water-street*, and 178, *Bedford-street*.
- Nov. 15, 1869 King, Jos., 18, *Exchange-alley W.*, and *Trelearen House, Blundell Sands*.
- Nov. 1, 1869 Kinsman, W. N., 8, *Derwent-road, Stoneycroft*.
- \*Jan. 14, 1889 Lassell, William, F.R.SS. L. and E., F.R.A.S., 27, *Milton-street*, and *Wapping*.
- Oct. 21, 1844 Lear, John, 14, *Cook-street* and *Stoneby Cottage, Stoneby Green, New Brighton*.
- Nov. 8, 1878 Lee, Hamilton, (Messrs. Lee & Nightingale), *North John-street*.
- Nov. 8, 1878 Lee, Harold (Messrs. Lee & Nightingale), *North John-street*.
- Dec. 11, 1871 Leigh, Richmond, M.R.C.S.E., 141, *Park-road*.
- Nov. 2, 1868 Lloyd, James, Vice-Consul, Argentine Confederation, 16, *Wellfield-Place, Peel-street, Prince's Park*.
- Nov. 1, 1875 Lutschaunig, Alfred, 64, *Cable-street*.
- April 17, 1865 MacCheane, Wm., M.R.C.S., 47, *Shaw-street*.
- April 20, 1868 Marples, David, *Lord-street* and *Cable-street*, and 5, *Mount Grove, Oxtan, Birkenhead*.

- Nov. 14, 1870 Marples, Joseph, 28, *Leece-street*, and *Fernlee*,  
51, *Whetstone Lane*, *Tranmere*.
- Nov. 17, 1878 Marples, Josiah, *Melvill Chambers*, *Lord-street*,  
and *Broomfield*, *Egremont*.
- Feb. 9, 1874 Marsden, Peter Crook, *Lymefield*, *Heaton*, near  
*Bolton*.
- Feb. 24, 1868 Marsh, John, *Ran Lee*, *Rainhill*.
- Jan. 21, 1889 Martin, Studley, 27, *Brown's-buildings*, and 177,  
*Bedford-street South*.
- Feb. 20, 1871 Mason, Alfred H., F.C.S., 56, *Hanover-street*, and  
811, *Upper Parliament-street*.
- Nov. 2, 1874 Matheson, Rev. A. Scott, *Dunneyat*, *Stanley-road*,  
*Booile*.
- Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.A.S., F.E.S.,  
*Pennant House*, *Lower Bebington*.
- Nov. 17, 1878 Mellor, James, Jun., *Sefton House*, *Great*  
*Crosby*.
- Dec. 14, 1874 Mellor, John, 2, *Church-road*, *Walton*.
- Oct. 81. 1859 Moore, Thomas John, Corr. Mem. Z.S., Curator  
Free Public Museum, *William Brown-street*,  
VICE-PRESIDENT.
- Nov. 15, 1869 Morgan, Alfred, 126, *London-road*, and 2, *Rath-*  
*bone-terrace*, *Wellington-road*, *Wavertree*, Hon.  
LIBRARIAN.
- Jan. 8, 1855 Morton, George Highfield, F.G.S., 122, *London-*  
*road*.
- April 16, 1849 Moss, Rev. John James, B.A., *Upton*, *Cheshire*.
- Oct. 29, 1850 Mott, Albert Julius, 82, *Church-street*, and *Adsett*  
*Court*, *Westbury-on-Severn*, EX-PRESIDENT.
- April 8, 1854 Mott, Charles Grey, 27, *Argyle-street*, *Birkenhead*,  
and *Cavendish-road*, *Birkenhead Park*.
- Mar. 28, 1874 McCulloch, D. B., 28, *Queen-buildings*, *Dale-*  
*street*.
- Dec. 14, 1874 Murphy, Martin, F.C.S., *College of Chemistry*,  
96a, *Duke-street*.
- \*Oct. 21, 1867 Muspratt, E. K., *Seaforth Hall*, *Seaforth*.

- Oct. 20, 1865 Nevins, John Birkbeck, M.D. Lond., M.R.C.S.,  
Lecturer on Materia Medica, Royal Infirmary  
School of Medicine, 8, *Abercromby-square*, Ex-  
PRESIDENT.
- Feb. 6, 1865 Newton, John, M.R.C.S., 20, *Marmaduke-street*,  
*Edge-hill*.
- Nov. 2, 1868 Norrie, Rev. B. A. W., M.A. Cantab., *The College  
School, Huyton*.
- \*Oct. 15, 1855 North, Alfred, 28, *Lansdown-Crescent, Notting-  
hill, London, W.*
- Dec. 10, 1866 Owen, Peter (Farnworth & Jardine), *Liverpool  
and London-chambers*.
- Feb. 21, 1870 Packer, James Macnamara, M.D., *Rose Cottage,  
Poplar Bank, Huyton*.
- Nov. 2, 1874 Palmer, John Linton, F.S.A., F.R.G.S., Fleet  
Surgeon R.N., 24, *Rock Park, Rock Ferry*.
- Dec. 15, 1878 Parnell, E. W., 19, *Deane-road, Edge-lane*.
- Nov. 16, 1874 Parratt, John, 68, *Rodney-street*.
- Mar. 8, 1869 Parratt, Thomas P., *Silverton, North Crosby-road,  
Waterloo*.
- Jan. 9, 1871 Patterson, John, 16, *Devonshire-road, Prince's  
Park*.
- Nov. 4, 1861 Philip, Thomas D., 48, *South Castle-street, and  
Holly-road, Fairfield*.
- Dec. 28, 1846 Picton, James Allanson, F.S.A., Chairman of the  
Library and Museum Committee, 11, *Dale-  
street, and Sandy Knowe, Wavertree*, PRESIDENT.
- Nov. 1, 1875 Picton, William Henry, *The Pines, Bromborough-  
road, Lower Bebington*.
- Nov. 16, 1874 Pim, Edward, 41, *Tithebarn-street*.
- April 30, 1868 Prag, Rev. Jacob, 85, *Mount-street*.
- Mar. 18, 1872 Pringle, Adam, *Grove Park*.
- Nov. 18, 1871 Proctor, Peter, M.R.C.S., and L.S.A. Lond., 18,  
*St. James's-road*.
- Nov. 1, 1875 Prytherch, John, M.D., *Mitford-street, Netherfield-  
road North*.

- Nov. 14, 1870 Marples, Joseph, 28, *Leece-street*, and *Fernlee*,  
51, *Whetstone Lane*, *Tranmere*.
- Nov. 17, 1878 Marples, Josiah, *Melvill Chambers*, *Lord-street*,  
and *Broomfield*, *Egremont*.
- Feb. 9, 1874 Marsden, Peter Crook, *Lymefield*, *Heaton*, near  
*Bolton*.
- Feb. 24, 1868 Marsh, John, *Ran Lee*, *Rainhill*.
- Jan. 21, 1889 Martin, Studley, 27, *Brown's-buildings*, and 177,  
*Bedford-street South*.
- Feb. 20, 1871 Mason, Alfred H., F.C.S., 56, *Hanover-street*, and  
811, *Upper Parliament-street*.
- Nov. 2, 1874 Matheson, Rev. A. Scott, *Dunneyat*, *Stanley-road*,  
*Bootle*.
- Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.A.S., F.E.S.,  
*Pennant House*, *Lower Bebington*.
- Nov. 17, 1878 Mellor, James, Jun., *Sefton House*, *Great*  
*Crosby*.
- Dec. 14, 1874 Mellor, John, 2, *Church-road*, *Walton*.
- Oct. 81. 1859 Moore, Thomas John, Corr. Mem. Z.S., Curator  
Free Public Museum, *William Brown-street*,  
VICE-PRESIDENT.
- Nov. 15, 1869 Morgan, Alfred, 126, *London-road*, and 2, *Rath-*  
*bone-terrace*, *Wellington-road*, *Wavertree*, HON.  
LIBRARIAN.
- Jan. 8, 1855 Morton, George Highfield, F.G.S., 122, *London-*  
*road*.
- April 16, 1849 Moss, Rev. John James, B.A., *Upton*, *Cheshire*.
- Oct. 29, 1850 Mott, Albert Julius, 82, *Church-street*, and *Adsett*  
*Court*, *Westbury-on-Severn*, EX-PRESIDENT.
- April 8, 1854 Mott, Charles Grey, 27, *Argyle-street*, *Birkenhead*,  
and *Cavendish-road*, *Birkenhead Park*.
- Mar. 23, 1874 McCulloch, D. B., 28, *Queen-buildings*, *Dale-*  
*street*.
- Dec. 14, 1874 Murphy, Martin, F.C.S., *College of Chemistry*,  
96a, *Duke-street*.
- Muspratt, E. K., *Seaforth Hall*, *Seaforth*.

- Oct. 20, 1865 Nevins, John Birkbeck, M.D. Lond., M.R.C.S.,  
Lecturer on Materia Medica, Royal Infirmary  
School of Medicine, 8, *Abercromby-square*, Ex-  
PRESIDENT.
- Feb. 6, 1865 Newton, John, M.R.C.S., 20, *Marmaduke-street*,  
*Edge-hill*.
- Nov. 2, 1868 Norrie, Rev. B. A. W., M.A. Cantab., *The College  
School, Huyton*.
- \*Oct. 15, 1855 North, Alfred, 28, *Lansdown-Crescent, Notting-  
hill, London, W.*
- Dec. 10, 1866 Owen, Peter (Farnworth & Jardine), *Liverpool  
and London-chambers*.
- Feb. 21, 1870 Packer, James Macnamara, M.D., *Rose Cottage,  
Poplar Bank, Huyton*.
- Nov. 2, 1874 Palmer, John Linton, F.S.A., F.R.G.S., Fleet  
Surgeon R.N., 24, *Rock Park, Rock Ferry*.
- Dec. 15, 1878 Parnell, E. W., 19, *Deane-road, Edge-lane*.
- Nov. 16, 1874 Parratt, John, 68, *Rodney-street*.
- Mar. 8, 1869 Parratt, Thomas P., *Silverton, North Crosby-road,  
Waterloo*.
- Jan. 9, 1871 Patterson, John, 18, *Devonshire-road, Prince's  
Park*.
- Nov. 4, 1861 Philip, Thomas D., 48, *South Castle-street, and  
Holly-road, Fairfield*.
- Dec. 28, 1846 Picton, James Allanson, F.S.A., Chairman of the  
Library and Museum Committee, 11, *Dale-  
street, and Sandy Knowe, Wavertree*, PRESIDENT.
- Nov. 1, 1875 Picton, William Henry, *The Pines, Bromborough-  
road, Lower Bebington*.
- Nov. 16, 1874 Pim, Edward, 41, *Tithebarn-street*.
- April 30, 1868 Prag, Rev. Jacob, 85, *Mount-street*.
- Mar. 18, 1872 Pringle, Adam, *Grove Park*.
- Nov. 18, 1871 Proctor, Peter, M.R.C.S., and L.S.A. Lond., 18,  
*St. James's-road*.
- Nov. 1, 1875 Prytherch, John, M.D., *Mitford-street, Netherfield-  
road North*.

- Nov. 14, 1870 Marples, Joseph, 28, *Leceo-street*, and *Fernlee*,  
51, *Whetstone Lane, Tranmere*.
- Nov. 17, 1878 Marples, Josiah, *Melvill Chambers*, *Lord-street*,  
and *Broomfield, Egremont*.
- Feb. 9, 1874 Marsden, Peter Crook, *Lymefield, Heaton*, near  
*Bolton*.
- Feb. 24, 1868 Marsh, John, *Ran Lee, Rainhill*.
- Jan. 21, 1889 Martin, Studley, 27, *Brown's-buildings*, and 177,  
*Bedford-street South*.
- Feb. 20, 1871 Mason, Alfred H., F.C.S., 56, *Hanover-street*, and  
811, *Upper Parliament-street*.
- Nov. 2, 1874 Matheson, Rev. A. Scott, *Dunneyat, Stanley-road*,  
*Bootle*.
- Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.A.S., F.E.S.,  
*Pennant House, Lower Bebington*.
- Nov. 17, 1878 Mellor, James, Jun., *Sefton House*, *Great Crosby*.
- Dec. 14, 1874 Mellor, John, 2, *Church-road, Walton*.
- Oct. 81. 1859 Moore, Thomas John, Corr. Mem. Z.S., Curator  
Free Public Museum, *William Brown-street*,  
VICE-PRESIDENT.
- Nov. 15, 1869 Morgan, Alfred, 126, *London-road*, and 2, *Rathbone-terrace, Wellington-road, Wavertree*, Hon.  
LIBRARIAN.
- Jan. 8, 1855 Morton, George Highfield, F.G.S., 122, *London-road*.
- April 16, 1849 Moss, Rev. John James, B.A., *Upton, Cheshire*.
- Oct. 29, 1850 Mott, Albert Julius, 82, *Church-street*, and *Adeett Court, Westbury-on-Severn*, Ex-PRESIDENT.
- April 8, 1854 Mott, Charles Grey, 27, *Argyle-street, Birkenhead*,  
and *Cavendish-road, Birkenhead Park*.
- Mar. 28, 1874 McCulloch, D. B., 28, *Queen-buildings, Dale-street*.
- Dec. 14, 1874 Murphy, Martin, F.C.S., *College of Chemistry*,  
96a, *Duke-street*.
- \*Oct. 21, 1867 Muspratt, E. K., *Seaforth Hall, Seaforth*.

- Oct. 20, 1865 Nevins, John Birkbeck, M.D. Lond., M.R.C.S.,  
Lecturer on *Materia Medica*, Royal Infirmary  
School of Medicine, 8, *Abercromby-square*, Ex-  
PRESIDENT.
- Feb. 6, 1865 Newton, John, M.R.C.S., 20, *Marmaduke-street*,  
*Edge-hill*.
- Nov. 2, 1868 Norrie, Rev. B. A. W., M.A. Cantab., *The College  
School, Huyton*.
- \*Oct. 15, 1855 North, Alfred, 28, *Lansdown-Crescent, Notting-  
hill, London, W.*
- Dec. 10, 1866 Owen, Peter (Farnworth & Jardine), *Liverpool  
and London-chambers*.
- Feb. 21, 1870 Packer, James Macnamara, M.D., *Rose Cottage,  
Poplar Bank, Huyton*.
- Nov. 2, 1874 Palmer, John Linton, F.S.A., F.R.G.S., Fleet  
Surgeon R.N., 24, *Rock Park, Rock Ferry*.
- Dec. 15, 1878 Parnell, E. W., 19, *Deane-road, Edge-lane*.
- Nov. 16, 1874 Parratt, John, 68, *Rodney-street*.
- Mar. 8, 1869 Parratt, Thomas P., *Silverton, North Crosby-road,  
Waterloo*.
- Jan. 9, 1871 Patterson, John, 16, *Devonshire-road, Prince's  
Park*.
- Nov. 4, 1861 Philip, Thomas D., 48, *South Castle-street, and  
Holly-road, Fairfield*.
- Dec. 28, 1846 Picton, James Allanson, F.S.A., Chairman of the  
Library and Museum Committee, 11, *Dale-  
street, and Sandy Knowe, Wavertree*, PRESIDENT.
- Nov. 1, 1875 Picton, William Henry, *The Pines, Bromborough-  
road, Lower Bebington*.
- Nov. 16, 1874 Pim, Edward, 41, *Tithebarn-street*.
- April 30, 1868 Prag, Rev. Jacob, 85, *Mount-street*.
- Mar. 18, 1872 Pringle, Adam, *Grove Park*.
- Nov. 18, 1871 Proctor, Peter, M.R.C.S., and L.S.A. Lond., 18,  
*St. James's-road*.
- Nov. 1, 1875 Prytherch, John, M.D., *Mitford-street, Netherfield-  
road North*.

- \*Jan. 22, 1866 Raffles, William Winter, 54, *Brown's-buildings*,  
and *Sunnyside, Prince's Park*.
- Nov. 12, 1860 Rathbone, Philip H., *Liverpool and London Chambers* (H), and *Greenbank Cottage, Wavertree*.
- Mar. 24, 1862 Rathbone, Richard Reynolds, 17, *Lancaster-buildings, Tilhebarn-street*, and *Beechwood House, Grassendale*.
- \*Jan. 7, 1856 Rawlins, Charles Edward, 12, *Rumford-court, Rumford-place*, and *Rock Mount, Rainhill*.
- Jan. 9, 1870 Rawlins, Gerald W., *Brook Cottage, Rainhill*.
- \*Nov. 17, 1851 Redish, Joseph Carter, 6, *Dingle-lane*.
- Jan. 10, 1876 Reid, Alexander, Royal Insurance Office, *North John-street*.
- Dec. 12, 1870 Rickard, Wm., LL.D., *Alverton House, 86, Upper Parliament-street*.
- Jan. 11, 1875 Richardson, Joseph (Messrs. Laces & Co.) *Union-court*, and 98, *Bedford-street South*.
- Nov. 29, 1869 Roberts, Isaac, F.G.S., 26, *Rock Park, Rock Ferry*.
- Feb. 4, 1867 Robinson, Joseph F., 1, *Knowsley-buildings, Tithe-barn-street*.
- Oct. 4, 1869 Rogers, J. Frederick (Dart & Rogers), *The Temple, Dale-street*, and 8, *Onslow-road*.
- Jan. 10, 1876 Rogerson, George Russell, F.R.A.S., F.R.G.S., 5, *Cook-street*, and *Waterloo Cottage, Waterloo*.
- April 18, 1854 Rowe, James, 16, *South Castle-street*, and 105, *Shaw-street*.
- Jan. 22, 1872 Russell, Edward R., "Daily Post," *Lord-street*, and 58, *Bedford-street*.
- April 7, 1862 Samuel, Harry S., 11, *Orange-court*, and 2, *Canning-street*.
- Nov. 80, 1874 Samuel, William Hy., 145, *Upper Parliament-street*.
- Mar. 19, 1866 Sephton, Rev. John, M.A., *Liverpool Institute*.
- Nov. 2, 1868 Sharp, Charles, *Liverpool Institute*.
- Nov. 16, 1868 Sheldon, E.M., M.R.C.S., 228, *Boundary-street*.

- Oct. 29, 1866 Shimmin, Hugh, 56, *Cable-street*, and *Tue Brook, West Derby*.
- Oct. 18, 1875 Simpson, James, 10, *Rumford-place*.
- Nov. 7, 1864 Skinner, Thomas, M.D. Edin., *Dunedin House, 64, Upper Parliament-street*.
- Dec. 10, 1866 Smith, Elisha (Henry Nash & Co.), 5, *India-buildings*.
- April 4, 1870 Smith, James, 9, *Lord-street*, and *Ribblesdale Villas, 22, Merton-road, Bootle*.
- Feb. 28, 1868 Smith, J. Simm, Royal Insurance Office, *Blount House, Croydon*.
- Feb. 24, 1862 Snape, Joseph, Lecturer on Dental Surgery, Royal Infirmary School of Medicine, 75, *Rodney-street*.
- April 20, 1874 Snow, Rev. T., M.A., 55, *Seel-street*.
- Nov. 8, 1878 Snowdon, Christopher, H.M. Customs.
- Jan. 24, 1876 Souttar, Robinson, Tramway Company, 8, *Castle-street*, and 18, *Christchurch-road, Claughton, Birkenhead*.
- Nov. 12, 1860 Spence, Charles 4, *Oldhall-street*.
- Feb. 10, 1862 Spence, James, 18, *Brown's-buildings, Exchange, and 10, Abercromby-square*.
- Nov. 27, 1865 Spola, Luigi, LL.D., 85, *Boundary-lane, West Derby-road*.
- Jan. 18, 1868 Stearn, C. H., Bank of England, *Castle-street*, and 8, *Eldon-terrace, Rock Ferry*.
- Nov. 1, 1875 Stevenson, John, *Prince Alfred-road, Wavertree*.
- Jan. 9, 1865 Stewart, Robert E., L.D.S., R.C.S., Dental Surgeon, Royal Southern Hospital, and Liverpool Dental Hospital, 87, *Rodney-street*.
- Oct. 18, 1858 Stuart, Richard, 11, *Manchester-buildings*, and *Brooklyn Villa, Breezes Hill, Walton*.
- \*Feb. 19, 1865 Taylor, John Stopford, M.D.Aberd., F.R.G.S., 1, *Springfield, St. Anne-street*.
- Jan. 28, 1848 Taylor, Robert Hibbert, M.D. Edin., L.R.C.S. Ed., Lect. on Ophthalmic Medicine, Royal Infirmary School of Medicine, 1, *Percy-street*.

- \*Jan. 22, 1866 Raffles, William Winter, 54, *Brown's-buildings*,  
and *Sunnyside, Prince's Park*.
- Nov. 12, 1860 Rathbone, Philip H., *Liverpool and London  
Chambers* (H), and *Greenbank Cottage, Wavertree*.
- Mar. 24, 1862 Rathbone, Richard Reynolds, 17, *Lancaster-  
buildings, Tithebarn-street*, and *Beechwood  
House, Grassendale*.
- \*Jan. 7, 1856 Rawlins, Charles Edward, 12, *Rumford-court,  
Rumford-place*, and *Rock Mount, Rainhill*.
- Jan. 9, 1870 Rawlins, Gerald W., *Brook Cottage, Rainhill*.
- \*Nov. 17, 1851 Redish, Joseph Carter, 6, *Dingle-lane*.
- Jan. 10, 1876 Reid, Alexander, Royal Insurance Office, *North  
John-street*.
- Dec. 12, 1870 Rickard, Wm., LL.D., *Alverton House*, 86, *Upper  
Parliament-street*.
- Jan. 11, 1875 Richardson, Joseph (Messrs. Laces & Co.) *Union-  
court*, and 98, *Bedford-street South*.
- Nov. 29, 1869 Roberts, Isaac, F.G.S., 26, *Rock Park, Rock  
Ferry*.
- Feb. 4, 1867 Robinson, Joseph F., 1, *Knowsley-buildings, Tithe-  
barn-street*.
- Oct. 4, 1869 Rogers, J. Frederick (Dart & Rogers), *The Temple,  
Dale-street*, and 8, *Onslow-road*.
- Jan. 10, 1876 Rogerson, George Russell, F.R.A.S., F.R.G.S.,  
5, *Cook-street*, and *Waterloo Cottage, Waterloo*.
- April 18, 1854 Rowe, James, 16, *South Castle-street*, and 105,  
*Shaw-street*.
- Jan. 22, 1872 Russell, Edward R., "Daily Post," *Lord-street*,  
and 58, *Bedford-street*.
- April 7, 1862 Samuel, Harry S., 11, *Orange-court*, and 2,  
*Canning-street*.
- Nov. 80, 1874 Samuel, William Hy., 145, *Upper Parliament-  
street*.
- Mar. 19, 1866 Sephton, Rev. John, M.A., *Liverpool Institute*.
- Nov. 2, 1868 Sharp, Charles, *Liverpool Institute*.
- Nov. 16, 1868 Sheldon, E.M., M.R.C.S., 228, *Boundary-street*.

- Oct. 29, 1866 Shimmin, Hugh, 56, *Cable-street*, and *Tue Brook*,  
*West Derby*.
- Oct. 18, 1875 Simpson, James, 10, *Rumford-place*.
- Nov. 7, 1864 Skinner, Thomas, M.D. Edin., *Dunedin House*,  
*64, Upper Parliament-street*.
- Dec. 10, 1866 Smith, Elisha (Henry Nash & Co.), 5, *India-buildings*.
- April 4, 1870 Smith, James, 9, *Lord-street*, and *Ribblesdale Villas*, 22, *Merton-road, Bootle*.
- Feb. 28, 1868 Smith, J. Simm, Royal Insurance Office, *Blount House, Croydon*.
- Feb. 24, 1862 Snape, Joseph, Lecturer on Dental Surgery, Royal Infirmary School of Medicine, 75, *Rodney-street*.
- April 20, 1874 Snow, Rev. T., M.A., 55, *Seel-street*.
- Nov. 8, 1878 Snowdon, Christopher, H.M. Customs.
- Jan. 24, 1876 Souttar, Robinson, Tramway Company, 8, *Castle-street*, and 18, *Christchurch-road, Claughton, Birkenhead*.
- Nov. 12, 1860 Spence, Charles 4, *Oldhall-street*.
- Feb. 10, 1862 Spence, James, 18, *Brown's-buildings, Exchange*, and 10, *Abercromby-square*.
- Nov. 27, 1865 Spola, Luigi, LL.D., 85, *Boundary-lane, West Derby-road*.
- Jan. 18, 1868 Stearn, C. H., Bank of England, *Castle-street*, and 8, *Eldon-terrace, Rock Ferry*.
- Nov. 1, 1875 Stevenson, John, *Prince Alfred-road, Wavertree*.
- Jan. 9, 1865 Stewart, Robert E., L.D.S., R.C.S., Dental Surgeon, Royal Southern Hospital, and Liverpool Dental Hospital, 87, *Rodney-street*.
- Oct. 18, 1858 Stuart, Richard, 11, *Manchester-buildings*, and *Brooklyn Villa, Breeze Hill, Walton*.
- \*Feb. 19, 1865 Taylor, John Stopford, M.D. Aberd., F.R.G.S., 1, *Springfield, St. Anne-street*.
- Jan. 28, 1848 Taylor, Robert Hibbert, M.D. Edin., L.R.C.S. Ed., Lect. on Ophthalmic Medicine, Royal Infirmary School of Medicine, 1, *Percy-street*.

## ASSOCIATES.

LIMITED TO TWENTY-FIVE.

- 1.—Jan. 27, 1862 Captain John H. Mortimer, "America." (Atlantic.)
- 2.—Mar. 24, 1862 Captain P. C. Petrie, "City of London," Commodore of the Inman Line of American Steam Packets. (Atlantic.)
- 3.—Feb. 9, 1868 Captain James P. Anderson, R.M.S.S. "Africa," Cunard Service. (Atlantic.)
- 4.—Feb. 9, 1868 Captain John Carr (Bushby and Edwards), ship "Scindia." (Calcutta.)
- 5.—Feb. 9, 1868 Captain Charles E. Price, R.N.R. (L. Young & Co.), ship "Cornwallis." (Calcutta and Sydney.)
- 6.—April 20, 1868 Capt. Fred. E. Baker, ship "Niphon;" (Chinese Seas.)
- 7.—Oct. 81, 1864 Captain Thomson, ship "Admiral Lyons." (Bombay.)
- 8.—Oct. 81, 1864 Captain Alexander Browne (Papayanni), S.S. "Agia Sofia." (Mediterranean.)
- 9.—April 18, 1865 Captain Alexander Cameron (Boult, English & Brandon), ship "Staffordshire." (Shanghai.)
- 10.—Dec. 11, 1865 Captain Walker, ship "Trenton."
- 11.—Mar. 28, 1868 Captain David Scott.
- 12.—Oct. 5, 1868 Capt. Cawne Warren.
- 13.—Oct. 5, 1868 Captain J. A. Perry.
- 14.—Mar. 22, 1869 Captain Robert Morgan, ship "Robin Hood."
- 15.—April 29, 1872 Captain J. B. Walker, Old Calabar.
- 16.—April 29, 1872 Captain Alfred Horsfall, S.S. "Canopus."
- 17.—Oct. 18, 1875 Captain John Slack.

## ADDITIONS TO THE LIBRARY.

Date announced.

1875.

OCTOBER 18th.

Donors.

La Société Royale des Antiquaires du Nord, Copen-  
hagen :—

Memoires (Nouvelle Série), 1866-74 - - - The Society.

Atlas de l'Archæologie du Nord (4to.), 1860 - The Society.

Islendinga Sögur, 1875 - - - The Society.

Geographischen Gesellschaft: Vienna :—

Mittheilungen, 1873-4 - - - - The Society.

La Société des Sciences Physiques et Naturelles de  
Bordeaux :—Memoires (2<sup>e</sup> Série), tome 1; Cahier ii., 1875 The Society.

The Society of Natural History, Boston :—

Proceedings, vol. xvii., parts 1, 2; 1874 - The Society.

Memoirs: i. Recent Changes of Level on the

Coast of Maine, by N. S. Shaler, 1874.

ii. The Species of the Lepidopterous Genus

*Pamphilia*, by S. H. Scudder, 1874: iii.

The Antiquity of the Caverns and Cavern

Life of the Ohio Valley, by N. S. Shaler,

1875. iv. Prodrome of a Monograph of

the *Tabanidae* of the United States: parti. The Genera *Pangonia*, *Chrysops*, *Silvius*,

etc., by C. R. Osten-Sacken, 1875; Obituary

Notice of Jeffries Wyman, M.D., obit.

1874, by Dr. Asa Gray - - - - The Society.

The Peabody Museum of American Archæology,

Cambridge, Mass. :—

Report, 1874 - - - - The Society.

- The American Association for the Advancement  
of Science :—  
 Proceedings, vols. ii.—xx., 1849—71 . . . *The Association.*
- The Geological Survey of India, Calcutta :—  
 Memoirs, vol. x., part 2., and vol. xi., part 1,  
 1874—5 . . . . .  
 Palæontologia Indica (4to), Series x., parts  
 1—4, 1874 . . . . .  
 Records of the Survey, vol. vii., parts 1—4,  
 1874 . . . . . *The Governor-General in Council.*
- The Essex Institute, Salem, Mass. :—  
 Bulletin vi., 1874 . . . . . *The Institute.*
- Proceedings of the Academy of Natural Sciences  
of Philadelphia, parts 1, 2, and 3, 1874 . . . . . *The Academy.*
- Det Kongelige Norske Universitet, Christiania :—  
 Die Ägyptischen Denkmäler in St. Peters-  
burg, Helsingfors, Upsala, und Copen-  
hagen, Von J. Lieblien, 1874 . . . . .  
 Grundtrækene i den Äldreste Norske Proces,  
R. Hertzberg, 1874 . . . . .  
 And several Pamphlets, &c. . . . . *The University.*
- The American Geographical Society, New York :—  
 Bulletin, 1874—5; Memorial Bulletin, Dr.  
Livingston, 1874 . . . . .  
 Address of Chief Justice Daly on the Geogra-  
phical Work of the World in 1878 . . . . . *The Society.*
- La Vie et les Œuvres de P. Chr. Asbjörnsen,  
Christiania, 1878 . . . . .
- The Geographical Distribution of Animals and  
Plants, by C. Pickering, M.D., Washington,  
1854 . . . . . *The Author.*
- The History of Paper-Hangings, &c., by G. H.  
Morton, F.G.S., Liverpool, 1875 . . . . . *The Author.*
- The Bombay Branch of the Royal Asiatic Society :—  
 Journal, no. 80, 1874, Bengal . . . . . *The Society.*
- The Society of Antiquaries, London :—  
 Proceedings, vol. vi., part 4, 1875 . . . . . *The Society.*

- The Anthropological Institute, London :—  
 Journal, April and July, 1875 . . . . . *The Institute.*
- The Royal Astronomical Society, London :—  
 Monthly Notices, vol. xxxv., nos. 6–8, 1875 *The Society.*
- The Chemical Society, London :—  
 Journal, 148–158, April–Sept., 1875 . . . . . *The Society.*
- The Royal Geographical Society, London :—  
 Proceedings, vol. xix., parts 8–7, 1875 . . . . .  
 Journal, vol. xliv., 1874 . . . . . *The Society.*
- The Geological Society, London :—  
 Journal, vol. xxxi., parts 2–8, 1875 . . . . . *The Society.*
- The Institution of Civil Engineers, London :—  
 Proceedings, vols. xxi.–xli., 1861–75 . . . . . *The Institution.*
- The Linnean Society, London :—  
 Journal (Botany), nos. 78–80, 1875 . . . . .  
 Journal (Zoology), no. 59, 1875 . . . . . *The Society.*
- The Royal Society of Literature, London :—  
 Transactions, vol. xi., part 1, 1875 . . . . . *The Society.*
- The Royal Asiatic Society, London :—  
 Journal, vol. vii., part 2, 1875, and 52nd  
     Annual Report . . . . . *The Society.*
- The Royal Society, London :—  
 Proceedings, nos. 160–2, 1875 . . . . . *The Society.*
- The Meteorological Society of Scotland, Edinburgh :—  
 Journal for 1874 . . . . . *The Society.*
- The Philosophical Society, Glasgow :—  
 Proceedings, 1874–5 . . . . . *The Society.*
- The Literary and Philosophical Society, Hull :—  
 Report, 1874–5 . . . . . *The Society.*
- The Naturalists' Field Club, Liverpool :—  
 Proceedings, 1878–4–5 . . . . . *The Club.*
- The Royal Institution of Cornwall, Truro :—  
 Journal, vols. xvi.–xvii., 1874–5 . . . . . *The Institution.*
- The Bristol Naturalists' Society :—  
 Proceedings, 1874–5 . . . . . *The Society.*

1875.

NOVEMBER 1st.

The Smithsonian Institution, Washington :—

Report for 1878 - - - - - *The Institution.*

The Department of War, Washington :—

Report for 1874 (8 vols.) - - - - - *The Secretary of War.*

The Department of Agriculture, Washington :—

Report for 1873 (2 vols.) - - - - - *The Commissioner.*

The United States Naval Observatory, Wash-

ton: Observations during 1872 (4to) - - *The Astronomer.*

The United States Geological and Geographical

Survey, Washington :—

- i. The Cretaceous Flora of the Western Territories, by Leo Lesquereux, 1874.
- ii. Report of the Survey of Colorado, &c., 1878.
- iii. Hand-book of the Ornithology of the North West, by Elliott Coues, 1874 - - - - - *Dr. F. V. Hayden.*

The Zoological Society of Philadelphia :—

Report for 1874 - - - - - *The Society.*

The Franklin Institute of Philadelphia :—

Journal, March-Sept., 1875 - - - - - *The Institute.*

The Academy of Natural Sciences, Philadelphia :—

Proceedings, 1874 - - - - - *The Academy.*

The American Philosophical Society, Philadelphia :—

Proceedings, no. 98, 1874 - - - - - *The Society.*

Reale Instituto Lombardo, Milan :—

- i. Memoires, 1. Classe di Scienze, Matematiche, e Naturali, vol. xii., fascioli 5. e 6, 1873-4 : 2. Classe di Lettere e Scienze, Morali e Politiche, vol. xii., fascicolo 4, 1873. ii. Rendiconti, Series ii., vol. v., fascioli 17-20, 1872 ; vol. vi., 1873 ; and vol. vii., fascioli 1-16, 1874 - - - - - *The Institute.*

The Royal Asiatic Society, London :—

Journal, vol. vii., part 2, 1875 - - - - - *The Society.*

The Geologists' Association, London :—	
Proceedings, April—September, 1875	- <i>The Association.</i>
The Meteorological Society of Great Britain, London :—	
Journal, 14 and 15, 1875	- - - - - <i>The Society.</i>
The Statistical Society, London :—	
Journal, vol. xxxviii., parts 1–8, 1875	- - - - - <i>The Society.</i>
The Royal Institute of British Architects, London :—	
Transactions, 1873–4	- - - - - <i>The Institute.</i>
The East Indian Association, London :—	
Journal, vol. ix., parts 1 and 2, 1875	- - - - - <i>The Association.</i>
The Quarterly Journal of Science, London, nos.	
46–48, 1875	- - - - - <i>The Editor.</i>
The Natural History Society, Bath :—	
Proceedings, vol. iii., part 2, 1875	- - - - - <i>The Society.</i>
The Berwickshire Naturalists' Field Club, Alnwick :—	
Proceedings, 1874	- - - - - <i>The Club.</i>
The Birkenhead Literary and Scientific Society :—	
Report, 1874–5	- - - - - <i>The Society.</i>
Archæological Researches in Kentucky and Indiana, in 1874, by F. W. Putnam, Boston, 1875	- <i>The Author.</i>
Notes on the <i>Ophidiidae</i> and <i>Ficimiaferidae</i> , by F. W. Putnam, Boston, 1875	- - - - - <i>The Author.</i>
Notes on <i>Liparis</i> and <i>Cyclopterus</i> , by F. W. Putnam, Boston, 1874	- - - - - <i>The Author.</i>
Report of the British Association, Belfast Meeting, 1874	- - - - - <i>Dr. Inman.</i>
Nature, to this date	- - - - - <i>The Editor.</i>

## NOVEMBER 15th.

The American Academy of Arts and Sciences, Boston :—	
Proceedings, New Series, vol. ii., 1874–5	- <i>The Academy.</i>
Harvard University, Cambridge, Mass. :—	
Catalogue, 1874–5	- - - - -
Annual Report of the President for 1873–4.	
Annual Report of the Treasurer for 1874	— <i>The University.</i>

- The American Association for the Advancement  
of Science :—  
 Proceedings, 28rd Meeting, 1874 - - - *The Association.*
- The Society of Natural Sciences, Buffalo (New  
York) :—  
 Bulletin, vols. i.—ii., 1878—5 - - - - *The Society.*
- The Orleans County Society of Natural Sciences,  
Burlington, Vermont :—  
 Archives of Science, vol. i., 1870-4 - - - - *The Society.*
- The Vermont Medical Journal, 1874 - - - - *The Editor.*
- The American Philosophical Society, Philadelphia :—  
 Proceedings, no. 94, 1875 - - - - *The Society.*
- The Franklin Institute of Philadelphia :—  
 Journal, October, 1875 - - - - *The Institute.*
- The United States Geological and Geographical  
Survey, Washington :—  
 Bulletin, 2nd Series, nos. 2 and 3, 1875 *Dr. F. V. Hayden.*
- The Department of Agriculture, Washington :—  
 Monthly Reports for 1874 - - - - *The Commissioner.*
- The Society of Arts, London :—  
 Journal, May to October, 1875 - - - - *The Society.*
- The Chemical Society, London :—  
 Journal, no. 154, October, 1875 - - - - *The Society.*
- The Linnean Society, London :—  
 Journal (Botany), no. 81, 1875 - - - - *The Society.*
- The Royal Society, London :—  
 Proceedings, no. 168, 1875 - - - - *The Society.*
- The Zoological Society, London :—  
 Proceedings, parts 1—8, 1875 - - - - *The Society.*
- Science-Gossip, London, May-October, 1875 - - - *The Editor.*
- Nature, to this date - - - - - *The Editor.*

NOVEMBER 29th.

- On Polishing the Specula of Reflecting Teles-  
copes, by W. Lassell, F.R.S., &c. - - - - *The Author.*

- The Anthropological Society, London :—  
 Journal, no. 18, 1875 - - - - - *The Society.*
- The Royal Astronomical Society, London :—  
 Monthly Notices, vol. xxxv., no. 9, 1875 - - - - - *The Society.*
- The Royal Medico-Chirurgical Society, London :—  
 Transactions, vol. lviii., 1875 - - - - - *The Society.*
- The Pathological Society, London :—  
 Transactions, vol. xxvi., 1875 - - - - - *The Society.*
- The Literary and Scientific Society, Birkenhead :—  
 President's Address, 1875 ; Rev. W. Binns  
 on the Development of English Literature in  
 its connection with the Literature of Europe *The Society.*
- The Philosophical and Literary Society of Leeds :—  
 Report, 1874-5 - - - - - *The Society.*
- The Geological Society, Liverpool :—  
 Proceedings, vol. iii., part 1, 1875 - - - - - *The Society.*
- The Philomathic Society, Liverpool :—  
 Proceedings, vol. xx, 1874-5 - - - - - *The Society.*
- The Free Public Library, Manchester :—  
 Report, 1874-5 - - - - -
- The Franklin Institute, Philadelphia :—  
 Journal, vol. lxx., part 5, 1875 - - - - - *The Institute.*
- Reale Instituto Lombardo, Milan :—  
 i. Classe di Scienze Mathematiche e Natu-  
 rali, vol. xiii., fasciolo i., 1874 : ii. Classe  
 di Lettere e Scienze Morali e Politiche,  
 vol. xiii., fasciolo i., 1874 - - - - - *The Institute.*
- The Canadian Institute, Toronto :—  
 Journal, vol. xiv., part 5, 1875 - - - - - *The Institute.*
- The Quarterly Journal of Science, London, Oct.,  
 1875 - - - - - *The Editor.*
- Science-Gossip, London, Nov. 1875 - - - - - *The Editor.*
- Journal of the Society of Arts, London (to  
 this date) - - - - - *The Society.*
-

DECEMBER 18th.

The Geological Society, London :—

Journal, vol. xxxi., part 4, Nov., 1875 - *The Society.*

The Geologists' Association, London :—

Proceedings, vol. iv., part 4, Nov., 1875 *The Association.*

The Linnaean Society, London :—

Proceedings, 1874-5 - - - - *The Society.*

The British Meteorological Society, London :—

Quarterly Journal, no. 16, Oct., 1875 - *The Society.*

The Royal Geological Society of Ireland, Dublin :—

Journal, vol. iv., part 2, 1874-5 - - - *The Society.*

The Watford Natural History Society, and Hert-

fordshire Field Club, Watford :—

Transactions, vol. i., parts 1 and 2, 1875 - *The Society.*

Anledning af Schopenhauers af det Throndhjem-

ske Videnskabers—Selskab belønnede Præis—

Afhandling om den frie villies Forhold til

Selvbindsthenden af M. J. Monad. Christi-

ania, 1872 - - - - *The University.*

Science-Gossip, London, Oct. 1875 - - - *The Editor.*

1876.

JANUARY 10th.

Report of the Secretary of War on the Operations  
of the Department during the year ending  
30th June, 1875, Washington - *The Secretary of War.*

Three Papers on "Ocean Circulation," by  
James T. Croll, Edinburgh, 1875 - - - *The Author.*

The Royal Scottish Society of Arts :—

Transactions, vol. ix., parts 1 and 2, Edin-  
burgh, 1874 - , - - - - *The Society.*

The Royal Physical Society :—

Proceedings, 1874-5, Edinburgh - - - *The Society.*

The Royal Cornwall Polytechnic Society, Fal-  
mouth :—

Report for 1874 - - - - *The Society.*

The Royal Astronomical Society :—				
Monthly Notices, London, Nov., 1875	-	-	-	<i>The Society.</i>
The Chemical Society :—				
Journal, London, Dec., 1875	-	-	-	<i>The Society.</i>
The Royal Geographical Society :—				
Journal, vol. xliv., London, 1874	-	-	-	<i>The Society.</i>
The Royal Microscopical Society :—				
Journal, vol. xiv., London, 1875	-	-	-	<i>The Society.</i>
The Institution of Civil Engineers :—				
Proceedings, vol. xlii., London, 1875	-	-	-	<i>The Institution.</i>
The Royal Institution :—				
Proceedings, vol. vii., parts 5 and 6, London,				
1875	-	-	-	<i>The Institution.</i>
The Royal Geological Society of Cornwall :—				
Transactions, vol. ix., part 1, Penzance, 1875	<i>The Society.</i>			
The Yorkshire Philosophical Society :—				
Report for 1874	-	-	-	<i>The Society.</i>

---

## JANUARY 24th.

The Natural History and Philosophical Society, Belfast :—				
Proceedings, 1874-5	-	-	-	<i>The Society.</i>
The Royal Observatory, Greenwich :—				
Observations during 1873 (4to.)	-	-	-	<i>The Government.</i>
The Anthropological Institute, London :—				
Journal, no. xiv., 1876	-	-	-	<i>The Institute.</i>
The Chemical Society, London :—				
Proceedings, Dec. 1875	-	-	-	<i>The Society.</i>
The Geologists' Association, London :—				
Proceedings, vol. iv., part 5, 1875	-	-	-	<i>The Association.</i>
The Royal Society, London :—				
Proceedings, no. 164, 1875	-	-	-	<i>The Society.</i>
The Quarterly Journal of Science, London, Jan., 1876	-	-	-	<i>The Editor.</i>
Science-Gossip, London, Jan., 1876	-	-	-	<i>The Editor.</i>

The Natural History Society of Northumberland and Durham, Newcastle-on-Tyne :—		
Transactions, vol. v., part 2, 1875	-	-
The Yorkshire Philosophical Society, York :—		
Report, 1874	-	-
Journal of the Society of Arts, London, to this date	-	-
Nature, to this date	-	-

---

## FEBRUARY 7th.

On a New Sponge of the genus <i>Luffaria</i> , from Yucatan, by Thomas Higgin	-	-	<i>The Author.</i>
The Plymouth Institution :—			
Transactions, 1874-5	-	-	<i>The Institution.</i>
The Asiatic Society of Bengal :—			
Journal, August, 1875	-	-	<i>The Society.</i>
The Royal Astronomical Society, London :—			
Monthly Notices, December, 1875	-	-	<i>The Society.</i>
The Royal Geographical Society, London :—			
Proceedings, vol. xx., part 1, 1875	-	-	<i>The Society.</i>
The Architectural and Archæological Society, Liverpool :—			
Proceedings, November and December, 1875	-	-	<i>The Society.</i>
The American Geographical Society, New York :—			
Proceedings, vol. iv., 1875	-	-	<i>The Society.</i>
The Canadian Institute, Toronto :—			
Journal, vol. xiv., part 6, 1875	-	-	<i>The Institute.</i>
Nature, to this date	-	-	<i>The Editor.</i>

---

## FEBRUARY 21st.

Der Königlichen Physikalisch - Ökonomischen Gesellschaft zu Königsberg, Schriften :—		
Vierzehnter Jahrgang, 1878	-	-
Fuenfzehnter Jahrgang, 1874	-	-
The Royal Asiatic Society, London :—		
Journal, vol. viii., part 1, 1875	-	-

The Royal Astronomical Society, London :—						
Memoirs (4to), vol. xlii., 1873-5	-	-	-	-	-	<i>The Society.</i>
The Chemical Society, London :—						
Journal, Jan., 1876	-	-	-	-	-	<i>The Society.</i>
The Royal Society, London :—						
Proceedings, no. 165, December, 1875	-	-	-	-	-	<i>The Society.</i>
The Statistical Society, London :—						
Journal, vol. xxxviii., part 4, 1875	-	-	-	-	-	<i>The Society.</i>
Science-Gossip, London, February, 1876	-	-	-	-	-	<i>The Editor.</i>
Nature, London, February 8 and 10, 1876	-	-	-	-	-	<i>The Editor.</i>
The Society of Arts, London :—						
Journal, January and February, 1876	-	-	-	-	-	<i>The Society.</i>
The Free Public Library and Museum, Liverpool :—						
Report, 1875	-	-	-	-	-	<i>The Committee.</i>
The Franklin Institute, Philadelphia :—						
Journal, vol. lxi., part 1, 1876	-	-	-	-	-	<i>The Institute.</i>
The Literary and Philosophical Society, Whitby :—						
Report, 1874-5	-	-	-	-	-	<i>The Society.</i>

---

MARCH 6th.

Philosophy without Assumptions, by Rev. T. P.						
Kirkman, M.A., F.R.S.	-	-	-	-	-	<i>The Author.</i>
La Société des Sciences Physiques et Naturelles,						
Bordeaux :—						
Mémoires, tome 1 (2 <sup>e</sup> Série), 2 <sup>e</sup> cahier, et						
Extrait des Procès Verbaux des Séances,						
1874-5	-	-	-	-	-	<i>The Society.</i>
The Royal Dublin Society, Dublin :—						
Journal, vol. vii., 1875	-	-	-	-	-	<i>The Society.</i>
The Royal Astronomical Society, London :—						
Monthly Notices, January, 1876	-	-	-	-	-	<i>The Society.</i>
The Chemical Society, London :—						
vol. xiv., part 1, 1876	-	-	-	-	-	<i>The Society.</i>
The Geological Society, London :—						
Proceedings, vol. xxxii., part 1, 1876	-	-	-	-	-	<i>The Society.</i>

The United States Geological and Geographical Survey of the Territories :—

- i. Descriptive Catalogue of the Photographs taken during the Expeditions, 1869-75.
- ii. Bulletin of the Survey, 2nd Series, no. 5, Washington, 1876 - - - Dr. F. V. Hayden.

The Society of Arts, London :—

Journal, February, 1876 - - - The Society.

Nature, London, February 17th and 24th, 1876 The Editor.

MARCH 20th.

The Works of Sir Benjamin Thomson (Count Rumford), vol. iv, Boston, 1875 *The American Academy of Arts and Sciences, Boston.*

The Society of Natural Sciences, Buffalo, New York :—

Bulletin, vol. iii., part 1, 1875 - - - The Society.

The Museum of Comparative Zoology, Harvard, Cambridge, Mass. :—

- i. Illustrated Catalogue (4to), no. 8, part 2 :  
The *Ophiuridae* and *Astrophytidae*, by Theodore Lyman, M.D. ii. Annual Report of the Trustees, 1875 - - - The Trustees.

The Royal Scottish Society of Arts, Edinburgh :—

Transactions, vol. ix., part 8, 1875 - - - The Society.

The Royal Geographical Society, London :—

Proceedings, vol. xx., part 2, 1876 - - - The Society.

The Linnean Society, London :—

Journal (Botany), nos. 60-2, 1875 - - - The Society.

The British Meteorological Society, London :—

Journal, no. 17, 1875 - - - The Society.

The Royal Society, London :—

Proceedings, no. 168, 1876 - - - The Society.

The East Indian Association, London :—

Journal, vol. ix., part 8, 1876 - - - The Association.

- The Literary and Philosophical Society, Manchester :—  
 Proceedings, vol. xiv., 1875 - - - - *The Society.*
- The American Geographical Society, New York :—  
 Bulletin, no. 1, 1876 - - - - *The Society.*
- The U. S. Geological and Geographical Survey :—  
 Bulletin, no. 6, Washington, 1876 - - - - *Dr. F. V. Hayden.*
- Science-Gossip, London, 1st March, 1876 - - - - *The Editor.*
- Nature, London, March 2nd and 9th, 1876 - - - - *The Editor.*
- Society of Arts, London :—  
 Journal, March, 1876 - - - - *The Society.*

## APRIL 3rd.

- Ancient Faiths and Modern, by Thomas Inman,  
 M.D., New York, 1876 - - - - *The Author.*
- L'Académie Royale Suédoise des Sciences de  
 Stockholm :—  
 i. Handlingar, (Mémoires,) 4to, Bandet ix,  
 1870; x, 1871, and xii, 1878. ii. Bihang.  
 (Supplément aux Mémoires), Bandet i.  
 Häftes 1-2, 1872-3, ib. ii.—1-2, 1874-5.  
 iii. Öfversigt (Bulletin), Årgangen 28-31,  
 1871-4. iv. Lefnadsteckningar, Bandet  
 i. Häfte 8, 1878 - - - - - *The Academy.*
- The Royal Asiatic Society, Bombay Branch :—  
 Journal, no. 31, Bombay, 1875 - - - - *The Society.*
- The Meteorological Society of Scotland, Edinburgh :—  
 Journal, nos. 47-8, 1875 - - - - *The Society.*
- The Royal Astronomical Society, London :—  
 Monthly Notices, February, 1876 - - - - *The Society.*
- The Chemical Society, London :—  
 Journal, vol. xiv., part 2, 1876 - - - - *The Society.*
- The Linnaean Society, London :—  
 Journal (Botany), no. 82, 1876 - - - - *The Society.*

- The Watford Natural History and Hertfordshire  
Field Club :—  
 Transactions, vol. i., part 8, 1875 - - - - - *The Club.*  
 The Smithsonian Institution, Washington :—  
 Report for 1874, &c., - - - - - *The Institution.*  
 Nature, London, March 16th and 28rd, 1876 - - - - - *The Editor.*
- 

APRIL 17th.

- Richerchè Electro-Dinamiche sulle Rotazione  
Paleogeniche, &c. Francesco Orsoni. Noto,  
1876 - - - - - *The Author.*  
 The Museum of Comparative Zoology, Harvard,  
Cambridge, Massachusetts :—  
 Report for 1875 - - - - - *The Trustees.*  
 The Botanical Society, Edinburgh :—  
 Proceedings, vol. xii., part 2, 1876 - - - - - *The Society.*  
 The Royal Society, Edinburgh :—  
 Proceedings, 1874-6 - - - - - *The Society.*  
 The Geologists' Association, London :—  
 Report for 1875, and Proceedings, vol. iv.,  
part 6, 1876 - - - - - *The Association.*  
 The Royal Society, London :—  
 Proceedings, no. 167, 1876 - - - - - *The Society.*  
 The Quarterly Journal of Science, no. 50, Lon-  
don, April, 1876 - - - - - *The Editor.*  
 The Astor Library, New York :—  
 Report for 1875-6 - - - - - *The Trustees.*  
 The State Library, New York :—  
 Report, vols. xlvi.-vii., 1878-4 - - - - - *The Trustees.*  
 The State Museum, New York :—  
 Report, vols. xxiii.-vi., 1869-72 - - - - - *The Trustees.*  
 The State University, New York :—  
 Report, vols. lxxvi.-vii., 1878-4 . . . . . *The University.*

The Royal Geological Society of Cornwall, Penzance :—

Report for 1875–6 . . . . . *The Society.*

The American Philosophical Society, Philadelphia :—

Proceedings, no. 95, 1876 . . . . . *The Society.*

The Franklin Institute, Philadelphia :—

Journal, vol. lxxi., parts 2–4, 1876 . . . . . *The Institute.*

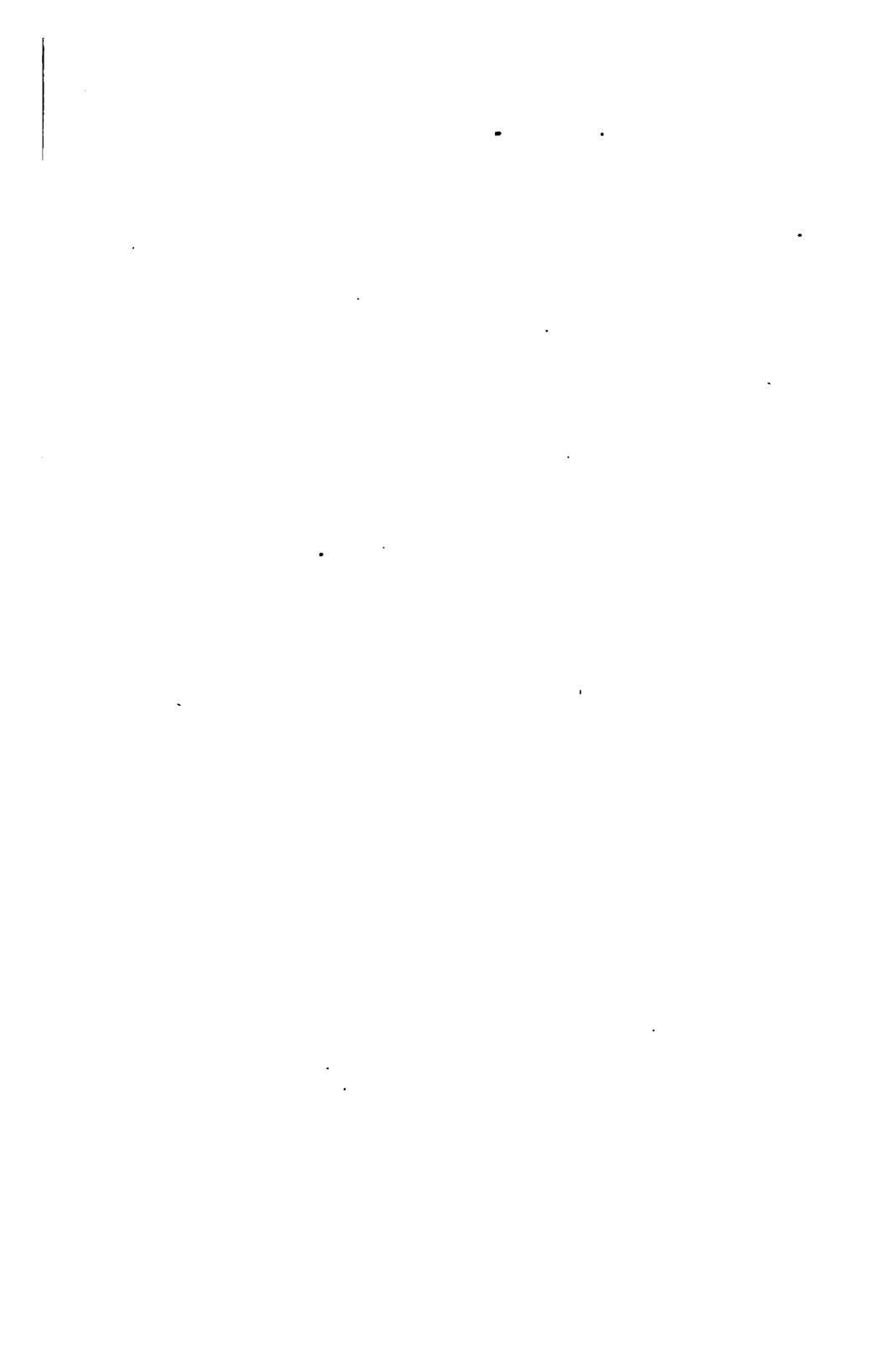
The United States' Geological and Geographical

Survey of the Territories :—

The Cretaceous Vertebrata (4to), by Professor  
E. D. Cope, Washington, 1875 ; and the  
Bulletin of the Survey, vol. ii, part 1,  
Washington, 1876 . . . . . *Dr. F. V. Hayden.*

Science-Gossip, London, April, 1876 . . . . . *The Editor.*

Nature, London, April, 1876 . . . . . *The Editor.*



## LIST OF SOCIETIES, ACADEMIES, INSTITUTIONS, ETC.,

TO WHICH THIS VOLUME IS PRESENTED.

(The asterisk denotes those from which Donations have been received this Session.)

- Alnwick* - - - - \*Berwickshire Naturalists' Field Club.  
*Bath* - - - - \*Natural History Society.  
*Belfast* - - - - \*Naturalists' Field Club.  
*Belfast* - - - - \*Natural History Society.  
*Bristol* - - - - \*Naturalists' Society.  
*Birkenhead* - - - - \*Free Public Library.  
*Birkenhead* - - - - \*Literary and Scientific Society.  
*Bordeaux* - - - - Société des Sciences, etc.  
*Bombay* - - - - \*Asiatic Society.  
*Boston* - - - - \*American Academy of Arts and Sciences.  
*Boston* - - - - \*Natural History Society.  
*Boston* - - - - \*The Massachusetts Boards of Agriculture,  
                             Education and State Charities.  
*Brussels* - - - - Académie Royale des Sciences, etc., de  
                             Belgique.  
*Chester* - - - - \*Natural History Society.  
*Chester* - - - - Architectural and Archæological Society.  
*Cambridge* - - - - Philosophical Society.  
*Cambridge* - - - - The Union Society.  
*Cambridge (Mass.)* \*Harvard University.  
*Cambridge (Mass.)* \*The Museum of Comparative Zoology.  
*Calcutta* - - - - \*Royal Asiatic Society of Bengal.  
*Calcutta* - - - - \*The Geological Survey of India.  
*Cherbourg* - - - - \*Société Imperiale des Sciences, etc.  
*Christiania* - - - - \*The University.  
*Copenhagen* - - - - L'Academie Royale.  
*Copenhagen* - - - - \*La Société Royale des Antiquaires du Nord.

- Dublin* - - - \*Royal Irish Academy.  
*Dublin* - - - \*Royal Geological Society of Ireland.  
*Dublin* - - - \*Royal Society.  
*Edinburgh* - - - \*Scottish Society of Arts.  
*Edinburgh* - - - \*Botanical Society.  
*Edinburgh* - - - \*Meteorological Society of Scotland.  
*Edinburgh* - - - \*Royal Physical Society.  
*Edinburgh* - - - \*Royal Society.  
*Edinburgh* - - - The Philosophical Institution.  
*Edinburgh* - - - Geological Society.  
*Falmouth* - - - \*Royal Cornwall Polytechnic Society.  
*Glasgow* - - - \*Philosophical Society.  
*Glasgow* - - - \*Geological Society.  
*Greenwich* - - - \*The Royal Observatory.  
*Grieswald (Prus.)* - The University—Dr. Julius Münter.  
*Hull* - - - Literary and Philosophical Society.  
*Halifax* - - - Literary and Philosophical Society.  
*Königsberg* - - - \*Königlichen Physikalisch Gesellschaft.  
*London* - - - \*Society of Arts.  
*London* - - - \*Royal Asiatic Society.  
*London* - - - \*Society of Antiquaries.  
*London* - - - \*Anthropological Institute.  
*London* - - - \*Royal Astronomical Society.  
*London* - - - British Association.  
*London* - - - British Museum.  
*London* - - - \*Chemical Society.  
*London* - - - Clinical Society.  
*London* - - - \*Royal Geographical Society.  
*London* - - - \*Geological Society.  
*London* - - - \*Geologists' Association.  
*London* - - - \*Linnean Society.  
*London* - - - \*Meteorological Society.  
*London* - - - \*Royal Society of Literature.  
*London* - - - \*Royal Society.  
*London* - - - \*Royal Institution.  
*London* - - - \*Statistical Society.

- London* - - - \*Medico-Chirurgical Society.  
*London* - - - Royal Institute of British Architects.  
*London* - - - \*Royal Microscopical Society.  
*London* - - - \*East Indian Association.  
*London* - - - \*Zoological Society.  
*London* - - - \*Institution of Civil Engineers.  
*London* - - - \*Editor of "Nature."  
*London* - - - \*Editor of "Quarterly Journal of Science."  
*London* - - - \*Editor of "Science Gossip."  
*London* - - - \*Editor of "Geological Magazine."  
*Leeds* - - - Philosophical and Literary Society.  
*Leeds* - - - Geological Society of West Riding of Yorkshire.  
*Liverpool* - - - Architectural Society.  
*Liverpool* - - - \*Historic Society.  
*Liverpool* - - - \*Geological Society.  
*Liverpool* - - - \*Philomathic Society.  
*Liverpool* - - - Polytechnic Society.  
*Liverpool* - - - \*Naturalists' Field Club.  
*Liverpool* - - - Chemists' Association.  
*Liverpool* - - - \*Numismatic Society.  
*Liverpool* - - - Royal Institution.  
*Liverpool* - - - \*Free Public Library.  
*Liverpool* - - - Medical Institution.  
*Liverpool* - - - Lyceum Library and News Room.  
*Liverpool* - - - Atheneum Library and News Room.  
*Leicester* - - - Literary and Philosophical Society.  
*Manchester* - - - \*Literary and Philosophical Society.  
*Manchester* - - - \*Free Public Library.  
*Manchester* - - - Chetham Library.  
*Manchester* - - - Owens College.  
*Manchester* - - - \*The Literary Club.  
*Melbourne* - - - Royal Society of Victoria.  
*Milan* - - - \*Reale Instituto Lombardo.  
*Newcastle-on Tyne* - \*Natural History Society.  
*New York* - - - Astor Library.

<i>New York</i>	- - -	*American Geographical Society.
<i>New York</i>	- - -	*New York Academy of Sciences.
<i>New York</i>	- - -	State University.
<i>New York</i>	- - -	*State Library.
<i>New York</i>	- - -	*State Cabinet of Natural History.
<i>New Haven</i>	- - -	Connecticut Academy.
<i>Otago</i>	- - -	Otago University.
<i>Oxford</i>	- - -	Ashmolean Society.
<i>Oxford</i>	- - -	*The Union Society.
<i>Plymouth</i>	- - -	*Plymouth Institute.
<i>Penzance</i>	- - -	*Royal Geological Society of Cornwall.
<i>Philadelphia</i>	- - -	*American Philosophical Society.
<i>Philadelphia</i>	- - -	*Academy of Natural Sciences.
<i>Philadelphia</i>	- - -	*Franklin Institute.
<i>Philadelphia</i>	- - -	*Zoological Society.
<i>Philadelphia</i>	- - -	*Pennsylvania Board of Education.
<i>Presburg</i>	- - -	Vriens für Natur-Kunde.
<i>Salem (Mass.)</i>	- - -	*Essex Institute.
<i>Salem (Mass.)</i>	- - -	*American Association for the Advancement of Science.
<i>Stockholm</i>	- - -	*Academy of Sciences.
<i>Southport</i>	- - -	Literary and Philosophical Society.
<i>Truro</i>	- - -	*Royal Institution of Cornwall.
<i>Taunton</i>	- - -	Somerset Archaeological Society.
<i>Toronto</i>	- - -	*Canadian Institute.
<i>Vienna</i>	- - -	*Geographischen Gesellschaft.
<i>Whitby</i>	- - -	*Literary and Philosophical Society.
<i>Watford</i>	- - -	*Natural History Society.
<i>Washington</i>	- - -	*Naval Observatory.
<i>Washington</i>	- - -	*The Commissioner of Patents.
<i>Washington</i>	- - -	*The Commissioner of Agriculture.
<i>Washington</i>	- - -	*Smithsonian Institution.
<i>Washington</i>	- - -	*The Secretary of War.
<i>Washington</i>	- - -	*The Geological Survey.
<i>York</i>	- - -	Philosophical Society.

TREASURER'S ACCOUNT, 1874-5.

The LITERARY AND PHILOSOPHICAL SOCIETY, in Account with R. C. JOHNSON, Treasurer.  
Ex.

Dr.		£ s. d.	£ s. d.
	1874-5.		1874-5.
To Balance brought forward.....		2 15 5	By Balance brought forward :—
To Cash paid T. Ray (Alterations) .....		19 0 0	Deck Bond .....
" Sevill & Co. (Clock) .....		8 15 0	By Cash paid for Subscriptions :—
" D Marples & Co., Limited (Printing) .....		168 19 6	174 Annual, at 21s. ....
" G. G. Walmsley (Printing) .....		10 7 0	28 Entrance, at 10s. 6d. ....
" Triling & Co., ditto .....		14 13 0	20 Arrear, at 21s. ....
" W. Tomkinson (Bookseller) .....		25 0 0	_____ 218 8 0
" Mr. Johnson (Teas) .....		20 16 2	By Cash on Account of Alterations :—
" S. Burke (Attendance) .....		1 17 6	From Naturalists Field Club..... 2 2 0
" " Secretary (Expenses) .....		18 8 11	From Historic Society..... 2 2 0
" " (Editorial Fee) .....		10 10 0	_____ 4 4 0
" " Treasurer for Sundries .....		0 5 0	By Cash, Interest on Deck Bonds .....
To Balance in hand (Deck Bond) .....		250 0 0	10 10 8
		_____ 2545 13 6	By Balances..... 62 4 3
To Balance .....		62 4 3	_____ 2545 13 6

Examined and found correct,

HARRY S. SAMUEL,  
EDWARD DAVIES.



PROCEEDINGS  
OF THE  
LIVERPOOL  
LITERARY AND PHILOSOPHICAL SOCIETY.

---

ANNUAL MEETING.—SIXTY-FIFTH SESSION.

ROYAL INSTITUTION, October 4th, 1875.

JAMES ALLANSON PICTON, F.S.A., PRESIDENT,  
in the Chair.

Mr. ALBERT JULIUS MOTT, the retiring President, occupied the Chair during that portion of the evening devoted to the usual business of the Annual Meeting.

The Minutes of the concluding Meeting of the previous Session were read and signed, after which the Honorary Secretary read the following

REPORT.

The prosperous condition of the Literary and Philosophical Society of Liverpool has undergone no material change during the past twelve months. At the commencement of the Session the number of ordinary members was two hundred and twenty. To these were added, by election, thirty others; but the deaths of four members, and the resignations of fifteen, the majority of whom left the neighbourhood, have diminished this accession, and the Society now musters two hundred and thirty-one ordinary members on its roll.

Of the four gentlemen deceased, Mr. W. J. Lamport, to whose memory the Society paid an appropriate tribute when recording his death in the minutes, had been a member for twenty-six years. Mr. Roger Lyon Jones had been on the roll for twenty-three years; and Mr. Jas. Fitzherbert Brockholes for nineteen years. At one time, Mr. Brockholes took an active part in the proceedings of the Society; and the results of his observations on the Entomology and Ornithology of the Cheshire district were frequently brought before the notice of the members. Four of his contributions on these subjects will be found in the eleventh, twelfth, fourteenth, and eighteenth volumes of the Society's Proceedings, one of them being an elaborate list of the Lepidoptera of the Hundred of Wirral. Nearly all the gentlemen who resigned were elected in recent years. Two of them, however, have been transferred to the list of Corresponding Members, for reasons which will be stated presently; and of the remainder, three gentlemen, namely, Mr. H. H. Statham, the Rev. W. H. Dallinger, and the Rev. W. A. Whitworth, M.A., have left behind them substantial evidence of their connection with the Society, in the form of valuable contributions to its volumes of Proceedings.

The death of Dr. J. E. Gray, F.R.S., keeper of the Zoological Collection in the British Museum, has reduced the number of Honorary Members to forty; and the list of Corresponding Members has been extended to fourteen by the election of three gentlemen, two of whom, as just stated, were previously Ordinary Members. Dr. Millen Coughtrey and Mr. Robert Gordon, the gentlemen referred to, had both contributed to the Society's Proceedings, the former by various communications on Comparative Anatomy, and the latter in particular by his translation of the inscription on the Burmese bell in the Free Museum. It was considered, therefore, that their removal abroad, and their appointment

to public positions which would give them facilities for still rendering good service to literature and science, was a fitting opportunity, not only of recognising their efforts on behalf of the Society, but of securing their continued interest in its labours, by recommending them for election as Corresponding Members.

The third of the newly-elected Corresponding Members is Mr. Edwin C. Reed, of the National Museum, Santiago, from whom an interesting communication on the habitat of the Vicuna was received in April last. This and other communications from Corresponding Members, received at the same time, will be found in the Society's forthcoming volume of Proceedings.

While the Council is thus able to point with satisfaction to the good work done by many among this class of the members, it is also glad to report that the Associates, the number of whom remains unaltered, are equally zealous in the collection of specimens, and in the acquisition of valuable information relative to the natural history of the marine fauna.

The Papers which were read at the meetings of the past Session were of considerable interest. The volume containing them has passed through the Press, and will shortly be ready for distribution.

During the last twelve months, the Library has received many valuable donations, among which may be named—A complete series of the Indian Geological Survey; the publications of the Museum of Comparative Zoology, in Cambridge, Massachusetts, which include the Revision of the *Echini*, by our recently-elected Honorary Member, Alexander Agassiz; and a full set of the Proceedings of the Institute of Civil Engineers, London, from 1860 to 1875.

The receipt of these works, in addition to the usual donations, together with the completion of the series of many

Transactions and scientific publications formerly defective, has rendered necessary the purchase of a new book-case, sufficiently large to meet the Society's requirements for some time to come. The Council has, therefore, great satisfaction in directing the attention of the members to the Library, which is in better order than at any former period.

The Council concludes its Report with the recommendation of the following members for election on the new Council :—Messrs. B. L. Benas, Birch, and Hetherington, Dr. Drysdale, and the Rev. J. Alden Davies.

The Honorary Treasurer next submitted his Annual Statement of Accounts, which was passed on the motion of Mr. King, seconded by Mr. Baruchson.

The following office-bearers and ordinary Members of Council were then elected to serve for the ensuing year :—Vice-Presidents — Alfred Higginson, M.R.C.S., Thomas J. Moore, Cor. Mem. Z. S. L., John J. Drysdale, M.D., M.R.C.S., F.R.M.S.; Honorary Treasurer — Richard C. Johnson, F.R.A.S.; Honorary Secretary — James Birchall; Honorary Librarian — Alfred Morgan; Members of Council — J. Campbell Brown, D.Sc., etc., Alfred E. Fletcher, F.C.S., W. Carter, M.B., Rev. E. M. Geldart., M.A., Edward R. Russell, Edward Davies, F.C.S., C. H. Stearn, George H. Morton, F.G.S., Rev. Jacob Prag, Baron Louis Benas, James Birch, J. Newby Hetherington, Rev. J. Alden Davies, James Smith.

The Associates of the Society were next re-elected.

The retiring President then vacated the Chair, and Mr. Picton having taken his place, it was moved by the Rev.

Henry H. Higgins, M.A., seconded by Dr. Nevins, and carried unanimously—

“That the cordial thanks of this Society be given to Mr. Albert Julius Mott, for the able and graceful manner in which he has performed the duties of President, and for the exceedingly valuable addresses he has given to the members during his term of office.”

Mr. MOTT having replied, the PRESIDENT read his First Inaugural Address,\* which was followed by a hearty vote of thanks.

Ladies were present at this Meeting.

#### FIRST ORDINARY MEETING.

ROYAL INSTITUTION, October 18th, 1875.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at the Meeting.

Messrs. James Simpson and Philip A. Hale were elected ordinary members.

The proceedings took the form of a *Conversazione* on Natural Science.

Mr. THOMAS HIGGIN, F.L.S., read the following Paper, “On some Sponges recently presented to the Free Museum,” specimens of which were exhibited in the room :—

Our friend, Mr. Moore, possesses the happy art of kindling in the breasts of many of our townsmen, whose business or pleasure takes them to other lands, a taste for inquiry into the natural history of the countries they visit; and, consequently, he is continually receiving from his numerous friends so situated contributions valuable both to the Museum

\* See page 1.

and to science. Amongst such contributions lately received have been several species of sponges which are worthy of notice. One, a large trumpet-shaped sponge, standing nearly four feet high, was collected at Ambergris Island, coast of Yucatan, by Dr. Barry, Staff-Surgeon at Corosal, and by him given to Staff-Surgeon-Major Samuel Archer, stationed at Belize, who presented it to the Museum. It proves to be new to science; and at present this fine specimen, which has thus come into the possession of the town of Liverpool, is the only one known to exist in any public collection. It is in excellent condition, and great praise is due to the gentlemen above named for the care bestowed upon its preservation, and also in its transmission to this country.

On presentation to the Museum, Mr. Archer gave the sponge the appropriate name of *Neptune's Trumpet*, and this name has been preserved, although it has been necessary to give it as well a specific name in placing it in the group to which it properly belongs; and, in giving it a name by which the species shall in future be known, it has been thought desirable, out of compliment to Mr. Archer, who never loses an opportunity of collecting anything which may be interesting and valuable to the Museum of his native town, to associate his name with it; consequently it has been duly christened *Luffaria Archeri*, and under this style its existence and its characteristic features have been made known in *The Annals and Magazine of Natural History*, to the September number of which I beg to refer those who may desire to cultivate an intimate acquaintance with our tall friend.

It is hollow throughout, the walls of the tube being of nearly equal thickness. The tube increases in diameter as it increases in length, and has been likened by Mr. Frank Archer to the large Alpine horn with which tourists in Switzerland are familiar—used there to awaken the mountain

echoes ; and if Neptune ever needed to hold converse with his friends at a distance, he would no doubt use a speaking-trumpet of this model shape to make himself heard above the roar of the tempest.

This sponge is a keratose or horny-fibred one, and belongs to a group to which the name of *Luffaria* has been given, because of the similarity of the appearance of its fibrous skeleton, when deprived of its dark-coloured sarcode, to the fibrous skeleton of the fruit of the gourd *Luffa* when denuded of its fleshy substance, a fruit which is used as a sponge in the West Indies, in those places where the common sea-sponge is not readily obtainable. This "vegetable sponge," as it has been called, has lately been introduced into this country as an article of commerce, and may be purchased at the druggists' shops, where it is sold as a flesh brush for use in the bath.

The skeleton network of the group *Luffaria* consists of clear amber-coloured hollow fibre, the hollow core of which has a lining or coating of fine granules. This fibre differs from that of the common sponge of commerce, in being amber-coloured, hollow, and rigid, the fibre of the sponge suitable for domestic purposes being solid and resilient. Both species have very dark-coloured sarcode ; and we have, fortunately, this evening, an opportunity of seeing a specimen of *Luffaria* and one of the common resilient sponges of commerce, growing on the same base, side by side. This mass of sponges, of which these two species are the most prominent, was lately obtained by that untiring searcher, Captain J. A. Perry, in shallow water, at Miragoâne, Hayti ; and, as they remain in the state in which they were when taken out of the water, having simply been dried, most of the sarcode remains adhering to the fibrous skeletons. The *Luffaria*, I need hardly say, is the tubular sponge, the common sponge being the rounded mass, covered with a

leathery skin. It is difficult to conceive, perhaps, that this ugly-looking lump can be anything like one of our nice clean bath sponges; but, if we were to wash away with water its dirty-looking sarcode, we should then have no difficulty in recognising in the horny skeleton that would remain, one of the open-textured West India sponges of commerce.

In this same group of sponges is one which is new to science; but its locus as to classification must remain for the present *sub-judice*. It is a straggler between the two groups, *Suberitida* and *Pachytragida*, and possesses flesh spicules which are peculiar to it, and are not known to occur in any other sponge. I am inclined so far to place it in the family *Stellettina*, pachytragous sponges with star-shaped spicules, chiefly congregated in the dermal covering, or as a dermal crust. It is very insignificant-looking, and therefore I will not draw your further attention to it.

The fragmentary black branched sponge, also presented by Captain J. A. Perry, is likewise new to science. It is one of the *Halichondroid* sponges, but it is remarkable in possessing the multihamate or birotulate spicule, a form which has hitherto only been found amongst the *Hexactinellid* sponges, and the presence of this form of spicule in sponges of this group is of much interest. On account of this peculiarity, it has been thought advisable to give it the specific name *birotulata*. It will therefore be called *Halichondria birotulata*. Since I have drawn the attention of Mr. H. J. Carter to it, the same spicule has been found in one of the *Porcupine* Expedition sponges, described by him under the name *Halichondria abyssi*.

Another specimen to which I propose to draw your attention this evening is one which Captain Perry has recently brought from Savanilla, coast of New Grenada. It is a beautiful variety of a sponge which has been found on our own coasts, and is described by Dr. Bowerbank, in his

*Monograph of British Sponges*, as *Hymeniacidon macilenta*. Its skeleton spicules are subpinlike fusiform acuate, and also large inequianchorates and bihamates, the flesh spicules being minute bihamates and minute equianchorates.

The skeleton is a network of fibre, composed of bundles of the pin-shaped spicules, held together by a minimum quantity of hornified sarcode. The surface of the sponge is a beautiful reticulation of fascicles of these spicules arranged in hexagonal areas, with lines from each of the angles of the hexagon meeting in its centre. Over this is stretched the dermal covering, studded with minute equianchorate and bihamate spicules, and pierced in the interstices of the network with pores. Large, simple, and contort bihamates are found on the skeleton lines, and the general network is also ornamented with rosettes, composed of the inequianchorates arranged in circles, with the small ends inwards. This is a beautiful feature in the skeleton of this sponge.

The only other sponge to which I shall have time to allude is a curious prickly-branched one, lately purchased by the Museum. It was first named from a mere fragment, by the late Dr. J. E. Gray, and by him was called *Axos Cliftoni*; and, afterwards, a fine example was described by Dr. Bowerbank, in the *Proceedings of the Zoological Society*, as *Dictyoclyndrus Cliftoni*. The sponge is a very rigid one, and the skeleton is made up of bundles of pin-shaped spicules, held together by very strong rigid horny material. Our specimen is, however, a variety of the one described by Dr. Bowerbank. The outward forms of both are very similar, and the skeleton spicule is of the same form in each; but the flesh spicules differ very much. In Dr. Bowerbank's sponge, the flesh spicule is rosette-like, of the Maltese cross pattern, while those of our variety are more of a stellate form, the ends of the rays being furnished with round knobs or spheres studded with small conical spines thickly placed together.

The other sponges, from Yucatan and Patagonia, presented by Captain Perry, possess many points of interest; but time does not admit of my detailing them on the present occasion.

Mr. G. H. MORTON, F.G.S., next read the following brief note, "On an Orthoceras, from the Millstone Grit of Sweeney Mountain, near Oswestry," which was also exhibited in the room :—

The large specimen of an Orthoceras, recently added to the Geological collection in the Free Museum, was discovered in the Millstone Grit of Sweeney Mountain, about twelve years ago, by Mr. J. Lester, of Llanymynech, who was engaged in working a quarry in that formation. He carefully worked the specimen out of the rock, and had it set up in the centre of a flower-bed in his garden, on the turnpike road, near Pant, between Oswestry and Llanymynech, about three miles from the spot where it was found.

Just two years ago I happened to pass Mr. Lester's house, and of course recognised the specimen as an Orthoceras, far larger than any I had ever seen, and the final result was, that it was purchased and deposited in the Free Museum.

Although the Orthoceras was exposed to the weather for so many years, it has not suffered any material injury. During this period it was well known in the neighbourhood as a *curious fossil, or carved stone*, presenting a miniature resemblance to one of the round towers of Ireland.

There is a record of this Orthoceras in an article in the *Geol. Mag.* for 1865, vol. 2, p. 110—"On the Fossiliferous character of the Millstone Grit at Sweeney, near Oswestry," by Mr. Wm. Prosser. It contains a list of the fossils, including "*Orthoceras giganteum* (?) Sweeney; very rare." The author remarks that "Savin's Quarry has yielded a splendid speci-

men of Orthoceras. In length it was 4 feet 6 inches, and its diameter at the ends 10 and 5 inches respectively."

In 1870, Mr. D. C. Davies, F.G.S., in a paper in the same magazine, on "The Millstone Grit of the North Wales Border," states, that "at Sweeney are found fragments of Orthoceratites; one tolerably perfect specimen measured six feet long, by one foot three inches across its mouth." This description also refers to the specimen under consideration.

Although the specimen is of especial interest on account of its great dimensions, much larger Orthocerata have been recorded. Sowerby\* refers to specimens fourteen to twenty feet long, at Closeburn, in Dumfriesshire; but more recent and described examples range from two to three feet in length; and the largest of these, when perfect, must have been about six feet long. A specimen, six feet two inches in actual length, and supposed to have been ten feet when perfect, is mentioned by De Verneuil; it was an American species.

This specimen is now three feet eleven inches long, the width at the summit three-and-a-half inches, and at the base fourteen inches; the apical angle being about twelve degrees. It measures only twelve inches in diameter perpendicular to the line of the original bedding, probably from pressure. There are the casts of twenty chambers above what seems to have been the cavity which contained a portion of the animal, and this final chamber is eighteen inches in length. Originally there must have been, at the least, thirty chambers, and the entire length of the shell was probably nearly six feet, so that it is an exceptionally large specimen.

The siphuncle of the Orthocerata sometimes presents an enormous development, and is subject to such considerable

\* *Min. Conc.*

modification, that generic distinctions have been founded upon it; but in a sandstone cast like the present example, such characters would have been obliterated. Still the position of the siphuncle is visible in the centre of each septum, where the specimen is broken across. About the apex the siphuncle is central, but in the lower septa it is sub-central, probably in consequence of external pressure. The specimen closely agrees with Sowerby's\* *Orthoceras giganteum*, excepting that in his figure the siphuncle is sub-central, and the exterior presents a smaller apical angle than the Sweeney specimen. It is a question whether a slight difference in the position of the siphuncle is of much importance; if it is, the specimen is not *Orthoceras giganteum*, but a new species of *Orthoceras*. So far as the apical angle is concerned, it is not of much importance, for it varies in the same species.†

Of equal interest with the size of the specimen is the occurrence of the *Orthoceras* in the Millstone Grit, for it is the only Cephalopod recorded from the formation, and it is an important species in the comprehensive list of fossils described from the Sweeney Sandstone by Messrs. Prosser and Davies.

The *Orthoceras* was found in the highest beds of the Millstone Grit, which, however, seem to represent Yoredale strata of other districts.

Dr. CARTER next presented a communication on "The Influence of Anæsthetic Agents on Insect-devouring Plants," which he illustrated by some interesting experiments.

Mr. T. MELLARD READE, F.G.S., exhibited diagrams of Sections of the Boulder Clay at Bootle Lane and the Cliffs of

\* *Mic. Conc.*

† Since this description was in type, Mr. Morton has seen a somewhat larger specimen in the Hunterian Museum of the University of Glasgow; and Dr. Ferdinand Roemer, of Breslau, has informed him that he has correctly named the Sweeney specimen as *Orthoceras giganteum*.

Blackpool, and made observations thereon. The President also added some remarks on the Glacial Periods of North-western Europe.

The following Paper was read by Mr. F. P. MARRAT, and selections exhibited of the shells referred to :—

“A Brief History of the Collection of Shells of the genus *Oliva*, or *Olives*, recently purchased from Mr. F. P. Marrat, by the Committee of the Free Public Library and Museum of Liverpool.”

Some ten or twelve years ago, Mr. Reeve, the author of the *Conchologia Iconica*, sold his collections of shells at the rooms of Mr. Stevens, King Street, Covent Garden, London. At this sale I purchased rather largely, and afterwards found several of the type shells figured in Reeve among my lots; more particularly was this the case in the genus *Oliva*. Many of the smaller species were separately and securely enclosed in pill-boxes, and named. At this time I knew very little of the shells comprising this extensive genus. The smaller *Cypræa* (*Trivia*) accompanying these were many of them belonging to species rare and difficult to procure; and I thought such might also be the case with the Olives, therefore I put them in safe keeping for some future time.

M. Rubilliard sent an extensive collection of shells to the same rooms, some five or six years after Reeve's sale mentioned above, and amongst these were ten lots of Olives, the finest series I had then seen; and even now they stand boldly out as prominent shells in the collection. I debated the point with myself, whether I should secure the whole, or allow them to be scattered broadcast. The result was that, after some spirited bidding, the whole of the lots were mine. I have since learned that M. Rubilliard had selected these shells from thousands of specimens caught in the neighbourhood of the Mauritius.

The method of fishing for these and similar molluscs was

related to me by Sir David Barclay, Bart., a gentleman who has often been engaged in this work, and who is well acquainted with M. Rubilliard. A line, with three or four strings attached, is baited with pieces of fish—one of the principal of these is the cat-fish—and thrown into the sea, where it is allowed to remain sufficiently long for the molluscs to settle down to their feast. When the line is hauled in they will be found to stick fast to the bait. A similar operation may be seen on our pier-head, when boys are fishing for crabs.

The impulse given by my obtaining the splendid shells mentioned above induced me to purchase largely, not only with a view of acquiring the shells similar to those figured as species, but also any varieties that might be found to differ from the type forms. After several years' careful study, the fame of my collection became widely spread, and I received specimens from various collectors in Europe, who were anxious to have their shells named correctly. In most cases they gave me the privilege of selecting from specimens so sent.

Many beautiful varieties were obtained by friends dredging on the West Coast of Africa, commencing at Madeira, and continuing these operations, as opportunities offered, all along the coast as far as Corisco Bay.

Either by purchase or otherwise the finest shells, selected from almost every lot imported, found their way into my drawers, until it required at least twenty to hold them.

Every visit to London enabled me to add to the stock some little. Either shells have come in excelling in size or quality anything previously collected, or some hitherto unknown beautiful variety was selected by the experienced eye from among a hundred others.

Correct localities have been obtained through the instrumentality of masters of vessels of our mercantile marine,

who have brought shells from several places from which they had not been previously recorded; and the service rendered by the sailing masters in the employ of Herr Godeffroy, of Hamburg, has been very useful.

As my opinions regarding specific value have not appeared in any of my Papers, I may be allowed to express them here.

Specific differences, confined within limited areas, constitute the exceptions, not the rule. In almost every case, when the shells can be obtained in numbers, they approach the so-called species above and below them, so as to render it a matter of uncertainty whether they should constitute a variety of the one or the other. It is only in extreme cases we find marked differences existing. Rare specimens, when two or three are all that have been procured, present these great differences. In this collection, many of the shells allied to the *O. Timorea*, Duclos, vary in an extraordinary way, no two of these being similar to each other.

Form was believed by the late Hugh Cuming to be indicative of specific character; but, in the shells just mentioned, the form is quite as variable as the marking. Shells will not be confined within specified limits, and all attempts at classification must be defective. I fear the study of the animals will not prove to be of a much more satisfactory nature, when we have obtained as much information on the numerous varieties as that which exists in the case of the shells.

We will next enquire how this collection will bear comparison with other and similar collections, formed on the Continent or in England. Duclos published a *Monograph* on this genus in the year 1835, in which book are represented all the finest shells contained in the celebrated collections of the French conchologists, and a hundred and eleven recent and twenty-six fossil species are described in this work.

We know of no other series of Olives having been made since that date; nor has anything of importance appeared in any of the Continental Conchological magazines. We may thus fairly infer that these are the choicest specimens in the European cabinets, and our shells will compare most favourably with any of the published figures.

Mr. Reeve published his *Monograph* in the year 1850, when the fine collections of H. Cuming and Miss Steere were selected as containing the choicest shells in this genus England could supply. A few other private cabinets, such as those in the possession of Mr. Cole and Mr. Metcalf, were examined, and a few choice varieties were thus obtained for his *Monograph*.

These were considered at the time the finest specimens known to English conchologists.

Mr. Reeve's book contains ninety-nine species, several of Duclos' specimens being considered by this author to be varieties of well-known shells. If we examine the subsequent works published on Conchology, we shall find very little information on the Olives. With the exception of a few small species from Australia, described by Mr. Angas and one or two others, nothing has since been done in this genus.

A comparison may be made by placing the shells selected from the Museum collection, or their figured representatives, by the side of the figured shells supplied from the English and French collections, when it will be found that our specimens, belonging to the respective varieties, are superior to those figured elsewhere:

- 1st. In size of specimen.
- 2nd. In beauty of marking.
- 3rd. In condition. (That is, our shells are highly polished, fresh as if just taken from the sea.)

Lastly, there are numerous varieties of which neither

figures nor descriptions are to be found in any of the works on Conchology.

As an extensive series, no public or private collection can be compared with this; nor do I think that, if selections could be made from every known source, and placed together in one large group, such a series would be found to equal the collection now in the Liverpool Museum.

In my *Monograph* on the genus *Oliva*, published in Sowerby's *Thesaurus Conchyliorum*, in 1871, two hundred and twenty species are figured, all of them, with the exception of less than a dozen, from specimens in the above collection.

Mr. T. J. MOORE exhibited the following selection from recent additions to the Free Public Museum:—

1. A fine tusk of the Siberian Mammoth (*Elephas primigenius*), purchased of Mr. Edward Charlesworth, F.G.S., who obtained it from a sale of ivory, recently imported to London from Siberia. Further consignments are reported to be doubtful, owing to the quantity being insufficient to make a remunerative sale. Such importations seem to have been made as far back as the earlier part of the last century.\*

The tusk now in the Museum measures eleven feet in length, following the outside curvature; and in greatest girth, one foot six inches. The weight is a hundred and twelve pounds. It has the characteristic double or spiral curve; is brown in colour; is very nearly perfect, wanting only a very few inches at apex and base; and, excepting about one-third of the surface, is as sound as recently imported elephant tusks from India or Africa.

A small cup, or tazza, made from similar Siberian ivory, was shown with the tusk.

\* See Owen, *British Fossil Mammals and Birds*, 1846, p. 249, quoting from the *Philosophical Transactions*, No. 446, 4to, 1787, p. 128.

2. Egg-sacs and spawn of various Molluscs (*Ampularia*, *Pyrula melongena*, *Strombus gigas*, etc.), and specimens of nine species of Crustaceans, from Honduras, collected and presented by Staff-Surgeon-Major Samuel Archer, Corresponding Member of the Society.

3. Skulls and bones of three specimens of Pouched Rats (*Geomys bursarius?*), collected and presented by Mr. James Roe, Assistant Commissary, Northern District, British Honduras.

4. Two young specimens, under six inches in length, of a rare fish, allied to Spinola's Deal Fish (*Trachypterus Spinolæ* of Cuvier and Valenciennes), taken at Malta, one in the spring of 1874, and the other on Jan. 19th, 1875, by Mr. C. A. Wright, who gave them to Capt. Horsfall, s.s. *Canopus*, Associate of the Society, by whom they were presented to the Museum, with various other marine specimens.

5. Specimens of Balani and Mangrove Oysters, with particulars of growth, collected and presented by Capt. J. Slack, Associate of the Society.

In the summer of 1874, Capt. Slack sailed for the River Gambia, in command of the steam dredge *Hercules*. She arrived in the Gambia, August 18th, 1874, and sailed thence Jan. 20th, 1875, for Rio Janeiro. Just before leaving the Gambia, Capt. Slack scraped from the hull of the *Hercules* a number of Mangrove oysters (*Ostrea parasitica* of Gmelin), which averaged two inches in greatest diameter of shell. Upon them were numerous small Balani of undetermined species, and a few others of a larger kind (*Balanus tintinnabulum*, Linn., variety), measuring very nearly an inch in diameter of base, and the same in height. These dimensions must have been attained within the period of five months (Aug. 18th to Jan. 20th) above named.

In addition to the above were four specimens of Balani

from the bottom of the boat belonging to the *Hercules*, taken after the boat had been only twenty-one days afloat on the Gambia. One specimen, *Balanus radiatus*, Sowerby, measures five-eighths of an inch in longest diameter of base; and the other three, *Chelonobia testudinaria*, Linnaeus, variety, vary from three-quarters to one inch in longest diameter of base. The names above given have been kindly supplied by Mr. F. P. Murrat.

6. A fine example, in obverse and reverse, of a large fossil fish, *Dapedius punctatus*, from the Lias, at Stone, Staffordshire, presented by Mr. R. Neilson. Length of fish, seventeen inches.

The Rev. H. H. Higgins then read the following Paper on "Our Social Wasps," with a note on a specimen of *Polistes*, taken at Ince Blundell :—

The true social wasps in this country are not of many kinds. In the south of Europe the species are more numerous, and in Brazil they are abundant. During an excursion of the Liverpool Naturalists' Field Club, in August last, to Ince Blundell, a member of the club, Mr. W. H. Mountfield, of the Liverpool, London and Globe Insurance Office, brought me a hymenopterous insect which he had just taken. It was, I felt sure, of a kind not known as a British species. Subsequently, on comparing the insect with "Monographie des Guêpes Sociales," by M. de Saussure, at the Liverpool Museum, I felt no doubt that the insect belonged to the genus *Polistes*, of which we have no native examples, and, with Mr. Mountfield's kind permission, the insect was sent to Mr. Frederick Smith, of the British Museum, who wrote as follows. "A few years ago specimens of a South American species of *Polistes* were taken at Penzance, in Liverpool, and in the London Docks. Those found at Penzance were fully accounted for. A vessel laden

with raw hides entered the harbour, and numbers of the *Polistes* were imported. A lady, whose house had windows at the back facing the harbour, took several in her bedroom and sent them to me. The captain of the vessel said that when they left Rio the flies swarmed on deck, and many accompanied the vessel throughout the voyage." Mr. Smith considers the Ince Blundell specimen to be *Polistes binotatus* of De Saussure, a native of Brazil, which does not appear to have previously been taken in England.

The social wasps of Britain have been figured and described in a work, not half so well known as it deserves to be, by Dr. Ormerod, published in 1868 by Longmans & Co. There are only seven species, of which the largest is the hornet, an insect generally regarded with fear and aversion, but capable of being domesticated and utilised as a household pet: see a paper in the *German Entomological Magazine*, by Pastor Muller, 1817. The following brief account, mainly from Dr. Ormerod's book, refers to the common wasp, *Vespa vulgaris*. The large wasps we see during the first warm days in spring are females, or mother wasps, which have passed the winter in concealment. What with late frosts, rains, birds, and little boys, comparatively few of the wasps which have lived through the winter survive to become the founders of colonies. When at last the wanderings of the future queen have come to an end, and she has discovered a hole or a branch to suit her taste, she enters on the work of her life. The first rudiments of the nest that is to be appear in the form of a little grey cap, suspended by the button at the top from a root or branch. Within the cap, with their openings downwards, are constructed four shallow cells, in each of which an egg is firmly glued. These cells are deepened as the enclosed eggs are hatched, an event attended with the earliest perils of wasp-life, the peril of dropping out of their cradles. Some perish in this way,

notwithstanding the admirable prehensile appliances with which the larva is furnished, consisting of the future mandibles at one end and a kind of disc at the other. The first perfect insects that appear are workers, which, as in the bees, are females not fully developed. By this time the queen has lost her power of making building-paper, her supply of saliva being exhausted, or rather diverted, and henceforth her duties are maternal, whilst the workers extend the nest from a little fairy ball, which might be hid in an egg-cup, to a great paper city. The loss of a queen amongst the wasps is not attended by the confusion which prevails when a similar calamity befalls a community of bees. The workers continue to build; they even lay eggs, but the eggs laid by workers produce only male wasps or drones, and the swarm gradually dies away. Towards the close of summer the eggs laid by the queen produce drones and females; the latter do no work in constructing the nest, which they seldom leave except for short distances to bask in the sunshine. They are carefully fed by the workers with the best of the food brought home, and by the time that the wasp community finally breaks up they are in a condition resembling that of the bears before they take up winter quarters. Every available space within the bodies of these future mother wasps is stored with masses of fat for consumption during the long winter retreat. Whilst I read these notes they are quietly sleeping, tens of thousands of them, it is hard to say where; but in March or April next they will make their appearance and enter upon the duties of providing for a succeeding generation.

The drones may be known by their much larger antennæ. No male insect has a sting. Wasp paper is made of vegetable fibres, masticated by the powerful jaws or mandibles of the insect. These jaws open transversely, not longitudinally, as ours do. The researches of Dr. Landois have established the fact that the hum of insects is not produced by the

organs of flight. On the abdomen and on the thorax may be observed little apertures called spiracles; these are respiratory openings, and with them are connected the tracheæ, or air tubes. The proper instrument of voice answering to our vocal chords, or nearly so, is a little horny comb, which is placed across the spiracle, and vibrates like the tongue of a Jew's harp or accordion with the passing current of air. This explains what I have often heard from a bee, a shrill hum when the wings have been confined. The wings modify, but do not produce the hum.

For further information on the life history of the social wasps, I may refer to a beautiful work by the Rev. J. G. Wood, *Homes without Hands*, the best of all his numerous works; and to the still more recent, and, as indicating a patient, loving search after truth, more wondrous investigations accomplished by Sir John Lubbock, which appeared first in *Nature*, and afterwards in his work on "Insect Life."

## SECOND ORDINARY MEETING.

ROYAL INSTITUTION, November 1st, 1875.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at this Meeting.

Messrs. W. H. Picton, Stevenson, Edmunds, Wilson, Prytherch, M.D., Doyle, and Lutschaunig were elected ordinary members.

Dr. CAMPBELL BROWN exhibited the magneto-electric machine, constructed on M. Gramme's principle, and illustrated its powers by several experiments.

Dr. CARTER exhibited a growing specimen of the Eucalyptus, and also a jalap plant, brought from the Botanic Gardens.

Dr. NEVINS exhibited a living specimen, recently born, of the snapping turtle.

The PRESIDENT read the following communication:—

I wish to communicate to the Society an episode, in the literary history of Liverpool, which may not be without its interest.

The publication of Mr. Curtis's mock heroic Latin poem of "Via Audax," giving a description of Bold Street, brought to my memory a *jeu d'esprit* of a similar character, published in 1820, in the *Kaleidoscope*, a local weekly literary journal, edited by Mr. Egerton Smith, of the *Liverpool Mercury*. It was entitled "Liverpool, an Heroic Poem, in Six Cantos," only four of which, however, saw the light.

The style and metre were those of Lord Byron's *Beppo* and *Don Juan*, mingling—

"The grave and gay, the lively and severe."

The poem exhibited decided talent, and attracted much attention, which was increased by the mystery and oddity by which its issue was surrounded. I will quote a verse or two at random, to illustrate the style, which will also show the enormous changes in the aspect and customs of the town which fifty-five years have brought about. He is describing Lord Street, which was then exceedingly narrow.

"Thy beauties, Lord Street, next attract the eye  
(The Corporation should have made thee wider);  
Along its well-trod pavement you may spy  
Cart, carriage, gig, pedestrian and rider;  
Here slumbering mud-beds 'lend their sullen dye,'  
So if you wish to cross, take a good stride, or  
Perhaps your foot by some curst chance may dart in,  
And soil 'th' unrivalled jet 'of Day and Martin.

" Here you may see, with slow and measured march,  
A crowd of stiff-necked dandies sauntering,  
From those who are *au fait* to stay and starch,  
And chest and waist to due proportion bring,  
To those who cannot tighten or enlarge,  
Yet think themselves, good souls, the very thing;  
In short, all nice gradations of a beau,  
From humble 'would be' up to '*comme il faut*.' "

In this strain he perambulates the streets, taking note of whatever is noteworthy, occasionally interspersing his comic with a vein of sentiment, *e.g.* —

" Oh, woman, woman ! loveliest, dearest, best,  
Oh, born our hearts' wild sallies to command !  
Whose smile can waken in the coldest breast  
All that is tender, holy, pure, and bland.  
Within thine arms we find a hallowed rest  
From all the cold world's wrongs: thy gentle hand  
Can press against the pallid brow of care,  
And warm to life and love the tide that lingers there."

The author preserved his incognito notwithstanding Mr. Smith's earnest endeavours to penetrate the secret. He was evidently an Irishman, from the wild recklessness of his rhymes and the allusions in the text.

He entitled himself, Shaughnessy O'Shaughnessy, Esq., of the County of Tipperary.

After two cantos had appeared, a letter was received from Dermot O'Goster, Lieut. in the 88th Infantry, informing the editor that the lamented Mr. O'Shaughnessy, after partaking too freely at the Star and Garter, then a fashionable Hotel in Paradise Street, had walked into the Old Dock, and so terminated his poetical career. A communication was subsequently made that the ghost of the deceased poet had appeared in a whiskey barrel, and supplied the missing

cantos. This is a remarkable foreshadowing of the spiritualistic communications of more recent years. Two more cantos subsequently were brought to light, and the subject terminated, and was forgotten for more than half a century.

An accidental circumstance recently brought to my knowledge the name of the author, who was a young gentleman from Dublin, named Brooke, and at that period filled a situation in the office of Messrs. Brown, Shipley and Co. He returned to Dublin, but of his subsequent career my informant had no knowledge. Since then I have obtained further information. Mr. Brooke went into the Church. He was for many years Chaplain of the Mariners' Church at Kingstown. He is still living, and is Rector of a parish in the South of England.

This little history is interesting in itself, but it will be felt to be much more so when I state that Mr. Brooke is the great grandson of the celebrated Henry Brooke, the author of the tragedy of the *Earl of Essex*, and of the *Fool of Quality*, which, in its abridged form of *Henry, Earl of Moreland*, has, perhaps, been the most popular novel ever written. It was highly praised and recommended by John Wesley, and, after going through many editions, was brought out in 1872, with a preface by Canon Kingsley. In the *Dublin University Magazine*, for 1842, will be found a memoir of Henry Brooke, by his descendant Richard, the poet of Liverpool. Mr. Brooke is also the father of a distinguished son, the Rev. Stopford Brooke, one of the Queen's Chaplains, a well-known author, and a distinguished member of the Broad Church School of English Theology. Several other members of the family are also known in the literary world, authorship having been indigenous in the family for several generations.

I thought a short notice of these incidents might not be unacceptable to the Literary and Philosophical Society.

Dr. CAMPBELL BROWN then read a Paper on "Electricity compared with Heat as a source of motive power."\*

### THIRD ORDINARY MEETING.

ROYAL INSTITUTION, November 15th, 1875.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at this meeting.

Messrs. W. Bellis and E. L. Fleming, F.C.S., were elected ordinary members.

The Rev. H. H. HIGGINS exhibited a copy of the *Primer*, published in the reign of Henry VIII., and an original copy of the *Book of Common Prayer*, published by Edward VI., also an original copy of the *Directory*, published by authority of Parliament in the reign of Charles I.

The PRESIDENT exhibited a collection of the Fine Art volumes recently added to the Free Library. A lengthened conversation followed on the comparative merits of English and French typography.

Mr. G. H. MORTON, F.G.S., exhibited a series of fossil corals from the carboniferous limestone of North Wales. The specimens were all remarkably perfect, and some of the species are of very rare occurrence. He also showed some photographs, indicating the position in the strata where the specimens were found in several localities, but principally in the neighbourhood of Llangollen.

Mr. R. C. JOHNSON, F.R.A.S., gave an account of the November meteors, and showed their path in the sky by a diagram on the blackboard.

\* See page 98.

Mr. T. J. MOORE exhibited the recently-mounted composite skeleton of the Elephant-footed Moa, *Dinornis elephantopus*, Owen, the bones of which were received from Capt. Hutton, Director of the Otago Museum, Dunedin, through the kind offices of Dr. Millen Coughtrey, Corresponding Member, early in the year, and a portion exhibited in their unmounted state, Nov. 16th, 1874. (See *Proceedings*, 1874-5, vol. xxix, p. xlvi.)

#### FOURTH ORDINARY MEETING.

ROYAL INSTITUTION, November 29th, 1875.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at the Meeting.

Messrs. D. E. Yates, J. H. Tetley, and W. Gardner were elected ordinary members.

Dr. Collingwood, one of the Honorary Members, and formerly Honorary Secretary to the Society, attended the Meeting.

Mr. LUTSCHAUNIG exhibited a small collection of aërolites and meteoric stones.

Mr. C. J. ENGLISH exhibited a horizontal section of one of the piles found among the remains of the Lake Dwellings near Rolle, on Lake Leman.

Mr. E. R. RUSSELL then read a Paper on "The True Macbeth."\*

\* See page 41.

## FIFTH ORDINARY MEETING.

ROYAL INSTITUTION, December 13th, 1875.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Messrs. E. Harpin, Peter Cowell, Jas. Barnes, and Jos. B. Hutchinson, M.R.C.S., were unanimously elected ordinary members.

The PRESIDENT read a brief communication on "The House of Stanley, and the Origin of its Legend of the Eagle and Child."\*

The Honorary Librarian read a Paper by Dr. INMAN, "On a Means employed for Removing and Erecting Menhirs."†

## SIXTH ORDINARY MEETING.

ROYAL INSTITUTION, January 10th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Messrs. Alexander Reid and Geo. R. Rogerson, F.R.A.S., F.R.G.S., were duly elected ordinary members.

Mr. ALFRED MORGAN, Honorary Librarian, read "A Few Notes on the Khāsi Hill Tribes, and the Geology of the Shillong Plateau."‡

Mr. JOSEPH BOULT read a Paper called "Gleanings from the Early History of Liverpool."§

\* See page 283.    † See page 108.    ‡ See page 115.    § See page 153.

## SEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, January 24th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were invited to the Meeting.

Messrs. Lewis Hughes and Robinson Souttar were duly elected ordinary members.

Mr. CHANTRELL invited the co-operation of the Society in assisting the proposed exhibition of English and Foreign Scientific Apparatus to be held at the South Kensington Museum in the ensuing summer.

Mr. R. C. JOHNSON, F.R.A.S., exhibited the new instrument called the Radiometer. This beautiful apparatus was invented by Mr. William Crookes, F.R.S., about two years ago, when engaged on researches into the laws of radiation of light. The instrument now exhibited was constructed by Herr Geissler, the well-known maker of vacuum tubes, and was obtained from Mr. Browning, of London. It consists of four small vanes, attached by short axes to a central cup, which is delicately suspended on a steel point. The vanes are metallic, polished on one side, and covered with a dead-black substance on the other, and the whole is enclosed within a glass globe, from which almost all the air has been exhausted by means of the Sprengel pump, the exhaustion being carried on for twelve to eighteen hours, and in some cases for four days. When the radiometer is subjected to the action of light the vanes immediately rotate in one direction—*i. e.*, the blackened vane moves from the light as if it were repelled. Sunlight or the electric light causes such rapid rotation that the vanes cannot be distinguished, while

the light of a taper will cause it to rotate two or three times in a minute. Its behaviour after extremely rapid rotation is very curious. When the light is withdrawn it soon stops, and then turns round for a few seconds in the contrary direction, finally resuming a motion in the normal direction, at a speed according to the amount of light in which it is placed. The action of this instrument is totally inexplicable upon any known laws of radiation, and, in spite of its having been subjected to almost every conceivable mode of experiment, it is yet impossible to decide the nature of the laws which govern it. Mr. Johnson remarked that physicists would wait with some curiosity the confirmation of the theory of light which will doubtless accrue from a further investigation.

Dr. CAMPBELL BROWN confessed the remarkable nature of the instrument, which appeared to realise a conversion of light into force; and remarks on the subject were made by the President and other gentlemen.

Mr. ALFRED MORGAN called attention to an article on Double Stars, in the last number of the *Quarterly Journal of Science*, and gave some details therefrom.

Mr. T. J. MOORE exhibited the skeletons of two species of Apteryx (*A. Mantelli* and *A. Owenii*), mounted by Mr. E. Gerrard, jun., and recently added to the Free Public Museum.

Mr. MOORE also exhibited, from the Derby collection in the same Museum, the first specimen of Apteryx ever brought to Europe, being the type specimen of *Apteryx Australis* of Dr. Shaw; and also the type specimen of Mantell's Apteryx, *A. Mantelli* of Bartlett, from the same collection; together with two recently acquired specimens, adult and young, of Owen's Apteryx, *A. Owenii* of Gould.

Dr. RICKARD then read an interesting Paper on "The Gems of Statuary, Ancient and Modern," illustrated with remarkable power and beauty by photographs under a magic

lantern. The exhibition of various works of Phidias, Praxiteles, Michael Angelo, Canova, Chantrey, M'Dowell, Foley, &c., was greatly applauded, and a discussion on the comparative merit of ancient and modern art, and other points, was conducted by the Rev. E. M. Geldart, Mr. H. S. Samuel, and the President, who also conveyed to Dr. Rickard the thanks of the Society.

#### EIGHTH ORDINARY MEETING.

ROYAL INSTITUTION, February 7th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at the Meeting.

Mr. T. J. Moore introduced Surgeon-Major Edward Nicholson, of the Army Medical Department, lately returned from India, and the author of a treatise on Ophiology, of great value to all interested in the snakes of India.\*

The PRESIDENT congratulated Mr. R. C. Johnson, on behalf of the Society, on his election as an F.R.A.S., and referred to his numerous astronomical contributions to the Society.

Mr. J. NEWBY HETHERINGTON then read a Paper on "Repetition and Reduplication in Language." †

\* *Indian Snakes. An Elementary Treatise on Ophiology, with a Descriptive Catalogue of the Snakes found in India and the adjoining Countries.* By Edward Nicholson, Surgeon, Army Medical Department. Second Edition. Madras, Higgin botham and Co. 1874. 1 vol. 8vo., pp. 186, plates i.-xx.

† See page 129.

## NINTH ORDINARY MEETING.

ROYAL INSTITUTION, February 21st, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at this Meeting.

The PRESIDENT exhibited a fac-simile of the Ardagh Chalice, presented to the Free Museum by Mr. Henry Yates Thompson, of Thingwall Hall. The original was found in a rath, or ancient hill fortress, near the village of Ardagh, in Limerick, September, 1868.

A discussion then ensued on Professor Crookes's experiments on a method of weighing a ray of light, and on his lecture given at the Royal Institution in London, on the "Mechanical Power of Light."

Mr. ALFRED MORGAN communicated the following note on "The Relation of Flowers to Insects":—

Sir John Lubbock, in his paper on "The Relation of English Wild Flowers to Insects,"\* details some experiments which he made in order to ascertain whether bees are capable of distinguishing colours, and which seem to prove that they possess the faculty of doing so. He placed some honey on a slip of glass, and put the glass on a piece of blue paper, and when the bee had made several journeys, and thus become accustomed to the blue colour, he placed some honey in the same manner on orange paper; then, during one of the absences of the bee, Sir John transposed the two colours, leaving the honey in the same place as before; the bee returned as usual to the place where she had been accustomed

\* *British Flowers considerd in Relation to Insects*, and also *Proceedings of Royal Institution of Great Britain*, vol. vii., p. 851.

to find the honey, but though it was still there she did not alight, but paused for a moment, and then darted straight to the blue paper. No one, he says, who saw the bee at that moment could doubt that the insect possessed the power of discriminating between the two colours.

In another experiment, after having accustomed the bee to come to honey on blue paper, he ranged other supplies of honey on paper of other colours, yellow, orange, green, red, black, and white; then he continually transposed the coloured papers, leaving the honey in the same spot, but the bee always flew to the blue paper wherever it might be.

Every student of nature knows as the result of Sprengel's, Darwin's, and Lubbock's researches, that there is an intimate relation existing between flowers and insects; bees, butterflies, &c., derive the main part of their nourishment from flowers, and the flowers themselves owe their existence to the functions performed by insects. Sprengel was the first who pointed out the service rendered by insects in the transference of the pollen from stamen to pistil, but Darwin was the first to perceive that the importance of this consisted not merely in the transference of the pollen from one organ to another, but from one plant to another, and that the colour, scent, and form of flowers is due to the insect visitors. Thus the lines and fronds which constitute the exquisite marking of flowers have reference to the position of the honey, and these "honey guides" are absent in night flowers, where, of course, they would be useless, because invisible. Night flowers are usually pale; for instance, *Lychnis vespertina* is white, while *L. diurna* is red.

Many flowers are fertilised by means of the wind simply, which distributes the pollen from one flower to another, or from pistil to stamen of the same flower; and it is remarkable that all wind-fertilised flowers have no colour, no scent, and no honey. When we consider that the largest and

most beautiful flowers owe the most to insect agency, we have an *a priori* reason for supposing that insects have a perception of colour, which Sir John Lubbock's experiments confirm. Recent researches show that insects, and especially bees, have an importance in relation to floral development that was, before the publication of Sprengel's observations, quite unsuspected. Sir John Lubbock thus concludes his Paper:—"To insects we owe the beauties of our gardens and the sweetness of our fields; to them flowers are indebted for their scent and colour, nay, for their very existence in their present form; not only have the brilliant colours, the sweet scent, and the honey of flowers been gradually developed by the unconscious agency of insects, but the very arrangement of the colours, the circular bands and radiating lines, the form, size, and position of the petals, the arrangement of the stamens and pistil, all have reference to the visits of insects, and are disposed in such a manner as to ensure the great object which these visits are destined to effect. For it is obvious that any blossom differing from the form and size best adapted to secure the due transference of the pollen would be less likely to be fertilised than others; while, on the other hand, those which were rich in honey, which were the sweetest and the most conspicuous, would most attract the attention and secure the visits of insects; and thus, just as our gardeners, by selecting seed from the most beautiful varieties, have done so much to adorn our gardens, so have insects, by fertilising the largest and the most beautiful flowers, unconsciously, but not the less effectually, contributed to the beauty of our woods and fields."

Mr. THOMAS WARD then read a Paper on "Salt, and its Export from the Ports of the Mersey." \*

\* See page 188.

**TENTH ORDINARY MEETING.****ROYAL INSTITUTION, March 6th, 1876.****JOHN J. DRYSDALE, M.D., M.R.C.S., VICE-PRESIDENT,  
in the Chair.**

Mr. J. L. PALMER, Staff-Surgeon, Royal Navy, read a communication giving some additional information which he had recently received concerning the sculptured figures in Easter Island.\*

Mr. ALFRED LUTSCHAUNIG then read a Paper on "Method in Creation."

**ELEVENTH ORDINARY MEETING.****ROYAL INSTITUTION, March 20th, 1876.****J. A. PICTON, F.S.A., PRESIDENT, in the Chair.**

Ladies were present at this Meeting.

Mr. G. F. Chantrell was unanimously elected an ordinary member.

The Rev. THOMAS P. KIRKMAN contributed a Paper on "The Janal 14-edra." †

Mr. JOSIAH MARPLES described a new method of reproducing engravings and altering their size by an adaptation of the electro-type process.

Mr. BARON LOUIS BENAS then read a Paper on "The Men who have Influenced Modern German Thought." †

\* See page 255.

+ See page 271.

† See page 225.

## TWELFTH ORDINARY MEETING.

ROYAL INSTITUTION, April 3rd, 1876.

JOHN BIRKBECK NEVINS, M.D., Ex-PRESIDENT, in  
the Chair.

Ladies were present at the Meeting.

Mr. ALFRED LUTSCHAUNIG exhibited a specimen of Apatite or Phosphorite, and made some remarks thereon.

Lieutenant CAMERON, R.N., who had arrived in Liverpool the previous day, on his return from his perilous journey across the Continent of Africa, was introduced to the Meeting by Mr. A. Morgan, and was received with acclamations.

Mr. W. T. BLACK, Surgeon-Major, then read a Paper on "The Partridges of South Africa, and Partridge Shooting in the Great Winterberg District, Cape of Good Hope,"\* and was followed by Dr. NICHOLSON, who read a Paper on "Indian Snakes."†

Mr. HIGGIN called attention to two specimens of the genus *Luffaria*, brought to the Free Museum by Capt. J. A. Perry, Associate of the Society, from Port-au-Prince, the apertures of the tubes of which retain the "duplicatures of dermal sarcode, which in a ring-like form surround the openings, and perform the sphinctral diaphragmatic office common to vents generally," as in the specimen in the British Museum, obtained fresh by Admiral Spratt, in the East Mediterranean, and preserved in spirit. (*Annals and Mag. Nat. Hist.*, September, 1875, ser. 4, vol. xvi., p. 227.)

Capt. PERRY, who was present at the meeting, exhibited the head, neck, and pouch of a Brown Pelican (*Pelecanus fuscus*,

\* See page 289.

+ See page 211.

Linnæus), and stated that he had found three different kinds of parasites infesting this bird—one peculiar to the pouch, a *Trinotion*, the males of which are remarkable for a stout curved obtuse spine, rugose at the summit, arising from the inner inferior angle of each tibia, having of course a sexual signification. The females are unarmed. It is believed to be new to science, and it is suggested that it should receive the name of *Trinotion bureae-pelecani*. This species is, as has been stated, limited to the pouch, none having been found on the body, though a minute search, on the occasion of a second bird having been procured, was instituted, with the view of determining any doubts as to its peculiar habitat. One or two only, obviously escapes, having been taken on the head and beak. Two other species, however, belonging to the feather-eating genera, *Colpocephalon* and *Lipeurus*, were procured from the body. Both are handsome species. Neither has yet been identified, but will probably be found common to many marine birds. Specimens of the above parasites, beautifully mounted as microscopic objects, were presented by Capt. Perry for the cabinet of the Museum.

#### THIRTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, April 17th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at this Meeting.

Mr. ARTHUR NEVINS, on the introduction of Dr. Nevins, read a communication explaining a method of correcting the rate of a marine chronometer for change of temperature, according to Hartnup's laws. He also contributed a set of

Tables for facilitating the calculations of the same corrections.\*

The PRESIDENT exhibited a series of specimens of beautifully variegated marbles, presented to the Free Museum by the Royal Academy of Fine Arts, Carrara, through the kind offices of the Director, Ferdinando Pelliccia, and of Signor Giovanni Fontana. They are from a rich collection presented to the Academy by Signor G. B. del Monte, from the ancient quarries recently discovered by him in Numidia, which were worked in the time of the Romans, and of which all traces had been lost.

Mr. A. MORGAN exhibited a specimen of Flexible Sand-stone from the Free Public Museum;† and Mr. J. L. PALMER, Staff-Surgeon, R.N., a Cola nut from the West Coast of Africa. The latter is used by the natives to prevent sleepiness. It is also used as a tonic, and has the power of making bad water sweet.

Mr. T. J. MOORE exhibited the following recent additions to the Free Public Museum:—

1. Two specimens of the Himalayan Ibex (*Capra Sibirica*), and two specimens of the Warryato (*Hemitragus hylocrius*), or "Neilgherry Ibex" of sportsmen, but really a species of wild goat. These were shot by Mr. St. George Littledale, and presented, with various specimens of birds, etc., collected by him during a recent tour in India, China, Japan, and the Rocky Mountains. Examples of the species above-named, especially of the Warryato, are of great rarity in collections. The task of properly preparing and preserving skins of such large game, by no means inconsiderable, is a heavy tax after a hard day's stalking, and hence it is rarely undertaken. The labour and expense of transport are also important items. These specimens had been prepared with great care, and in consequence had been very success-

\* See page 227.

† For remarks upon it see page 228.

fully mounted by Mr. Henry Reynolds, taxidermist to the Museum.

Mr. Littledale kindly supplied the following notes respecting the Warryato :—

"The 'Neilgherry Ibex,' or Wild Goat, is confined almost exclusively to two ranges of hills, rising to about seven thousand feet elevation, the Koondahs (the western hills of the Neilgherries), and the Annamullies, about twenty miles distant, and separated by the Wynaad Jungle. These animals are not nearly as numerous as they were formerly. They are a favourite food of the tiger ; and a *saddle-back* (an old male with a white mark on his back) is considered a great trophy by sportsmen, so that they have no peace. In the fine weather they live on the western cliffs of the Koondahs, but are driven on to the eastern slopes during the monsoon. They go in large herds ; I have counted over fifty in one. The old males of the herd perch themselves on rocks, and stand motionless for ten minutes together on the look-out, and then suddenly they move and look in another direction. It is utterly impossible to get underneath them on the cliff without them seeing ; they can only be approached from above. When a shot is fired they all collect together, and then make off under the guidance of some old male. Herds are occasionally met with in the jungle, when they are migrating from one set of hills to the other. An old sportsman of the Neilgherries estimated the total number remaining to be between three and four hundred."

2. The following specimens, presented by Mr. Hugh Heywood Jones, collected by him during a shooting excursion in Thibet and the North Western Himalayas, in 1875 :—

Head and horns of Hodgson's Antelope, or Chiru, *Pantholops Hodgsonii*, from Chang Chenmo, Thibet, at an elevation of about seventeen thousand feet. Mr. Jones states that

the animals he fell in with were so infested by bots that their skins would have been unfit for stuffing. Choughs were continually observed searching for the bots on the backs of the Chiru.

Head and horns of the Oorial, or Punjab Wild Sheep, *Ovis cycloceros*, from the Salt Range.

Head and horns of the Burrhel, or Blue Wild Sheep, *Ovis nahura*, from Ladakh; and a young skull of *Ovis Vignei*.

A large Flying Squirrel, *Pteromys inornatus*, Kashmir. The Shikarries say that it lives in its hole in winter on food stored in summer, and that it is often killed in mid-winter.

Specimens, adult and young, of the Thibet Marmot, *Arctomys bobac*, from the Gya Valley, Ladakh; one of the largest species of Marmots known.

Specimens of *Lagomys*, Voles, Musk Shrew, skulls of two species of Hares, etc., were also included in the collection, which, when mounted, will form an important addition to the Museum.

3. The skull and bones of a *Susu*, or fresh-water Porpoise (*Platanista Indi?*), from Mooltan, specially procured for the Museum by Lieut.-Col. C. A. McMahon. The Susus are peculiar to the fresh-waters of India, those from the Ganges and its tributaries being distinct from those of the Indus system. They are of small size, the beak remarkably prolonged and slender, with numerous sharp, curved teeth in each jaw, the shortest being at the gape, and the longest at the snout. Both skull and skeleton present peculiar modifications of form. Though often seen in certain localities, they are only caught with extreme difficulty, and are rarely taken by fishermen.

4. A rare Siluroid Fish, of the genus *Plecostomus*, from Uruguay, called by the natives *Viega del Aqua*, or Old Woman of the Water, presented by Mr. W. P. Steer,

Estancia del Ombu, Porongos. Among the many remarkable forms of Siluroid fishes, this genus is one of the most singular. The head forms one immense armour-plate ; the scales are of similar character, with the addition of a keel or boss, covered with spines, on each ; and the first ray of the pectoral and ventral fins is a formidable spine, that of the pectorals being profusely covered with rough recurved smaller spines of considerable length. Some dozen species are described in ichthyological works, but few are to be seen in collections. They are peculiar to tropical America.

5. Various weapons and implements from West Africa, collected and presented by Mr. R. B. N. Walker, F.R.G.S., Corresponding Member of the Society. The most remarkable were a singularly-shaped Tomahawk, or Throwing Knife, from the Osyeba, or Ba-Fanh, somewhat similar to one figured by Du Chaillu, in his *Equatorial Africa*, 1861, p. 79 ; and a primitive form of Bellows, from Batanga, which the natives use in the working of iron.

6. Mr. MOORE stated that a Cetacean of considerable size having been reported in the papers to have been stranded at West Kirby, on the Cheshire side of the Dee, on the 22nd of March last, he proceeded to the spot, but too late to see more than mutilated portions of the creature, which was cut up, and in process of boiling down for the oil. The head had been divided into several portions. The upper and under jaws were cut away, but not otherwise much injured. The teeth were eleven on each side of the lower jaw, and twelve on each side of the upper, the longest projecting an inch and a half beyond the gum. The tail and flippers, both pectoral and dorsal, had been severed from the carcase, but were otherwise intact. Sketches of these were made, and the two pectoral flippers secured for the Museum, where they will be skeletonised. The specimen was a male, and was stated to have been twenty-five feet long.

The total length could not be verified, but the following dimensions were accurately taken :—

			Feet. Inches.
Tail : width from tip to tip	...	...	6 6
Dorsal fluke : width at base	...	...	2 2
"            height	...	...	3 7
Pectoral fins : greatest width	...	...	2 5
"            length	...	...	3 6

This creature would thus appear to have been a specimen of the Grampus or Killer, probably *Orca gladiator*, whose habitat is the North Sea, and of which specimens have been taken as far south as the Thames, but which occurs much more frequently off the Shetland and Orkney Islands. It is altogether new to our local fauna, and is therefore deserving of special notice, no instance being recorded of its previous occurrence within the Liverpool district. The fierceness and voracity of the Killer are extreme, and it is a great enemy to porpoises and seals. It is remarkable that this specimen, in its death agony, threw up a quantity of feathers of sea-fowl! as I was informed by a credible eye-witness, Mr. Peter Lunt, of West Kirby, the purchaser of the carcase, to whom I am indebted for permission to examine the remains. Two or three feathers were still sticking to the sides of the gullet when I made my inspection.

Mr. RICHMOND LEIGH, F.R.C.S., then read a Paper on "Vegetation and Climate."\*

**PAPERS READ DURING SESSION.**



## A D D R E S S.

By J. A. PICTON, F.S.A., PRESIDENT.

FIRST of all I have to thank you for the honour you have done me in my election for a second term President of a Society which has for so many years stood in the van of literary and scientific progress in this locality. It is an honour which was unsought, and, if I may venture to say so without being misunderstood, undesired. I have already enjoyed the honour, and have arrived at a period of life when the energies begin to flag, and when, for reasons both personal and public, it is not desirable to take a very prominent position.

In early life, when the mind first begins to feel its powers, and the wide expanse of knowledge stands ready for occupation, every acquisition is hailed as a triumph and conquest. Our attention is taken up by the positive additions to our attainments; but as we advance in life, we become gradually aware of the extent of our ignorance—of the vast proportion which the things we do not know bear to those about which we have any real information. If this experience does not teach modesty and self-distrust, the lessons of life have been learned in vain.

It is therefore with some hesitation that I consent to occupy a position which might be better filled by a younger and more vigorous selection, but, having accepted the office, I will do the best in my power to fulfil its duties.

Within the last few years it has become the rule for your President, at the commencement of each Session, to give an

Introductory or Inaugural Address. I think the rule a good one. It is a stimulus to the President to prove himself worthy of his office, and it naturally gives a wholesome impulse to the members to follow his example.

In framing these addresses, there is some difficulty in hitting the exact point. Vague declamations on the objects and advantages of science and literature, are apt to become stale and unprofitable; whilst the selection of any technical subject, on which to enlarge, resembles too much the ordinary Papers of the Session.

My immediate predecessor has wisely avoided both these extremes in the selection of his subjects; and in his addresses on prehistoric civilisation, and the vicissitudes to which human progress has been liable, has afforded a model for the general character of such compositions, which his successors may study with advantage.

I think I cannot do better than follow the course of ideas which our late President so ably initiated. He has traced out the symptoms of early civilisation in countries and periods very remote from our own, and speculated on the changes, retrogressive as well as progressive, which the human race has undergone, and of which evidences are visible to those who will seek for them. I propose to transfer the inquiry from the past to the future. I take the present state of things as we find it, by whatsoever means brought about, and I ask the question—In what direction, and towards what ends, is the current of human affairs flowing? Though the inquiry is too subtle to allow us to arrive at any very definite conclusions, and it would be presumptuous to dogmatise on a subject of such vast extent, yet there lie scattered about us, loosely and vaguely it may be, on every side, indications, more or less clear, of the development of ideas, the breaking up and re-formation of institutions, the necessary effects of material progress on the habits

of mankind, both personal and national, and the inter-penetrat<sup>ion</sup> of thought necessarily resulting from the unlimited intercourse of modern times, which may enable us, with more or less accuracy, to determine the bearings of the current along which we are drifting.

My subject this evening, therefore, will be—

### THE TENDENCIES AND THE FUTURE OF MODERN CIVILISATION.

It is necessary, in the first instance, to form a clear notion of what we understand by the employment of this term. Its ideal is not fulfilled by material prosperity ; by extensive empire ; by refinement of taste ; by the rigorous and impartial administration of law ; by the heights of philosophical thought to which a favoured few may soar ; nor even by the existence of religious principles derived from the purest source. Some of these may be present, and carried to a high degree of perfection, and yet the highest style of civilisation may be far from attainment.\*

Our late President, in his Address of October, 1872, thus sets forth his view : " Clearly the word civilisation refers to man himself, and not either to his works or his surroundings. It is his intellectual and moral being that we speak of, and we call him civilised or not according to the culture of his mind and the character of his behaviour."

M. Guizot thus explains his view of the subject : " Il m'a

" Une grande amélioration sociale, un grand progrès du bien-être matériel, manifestent-ils chez un peuple sans être accompagnés d'un beau développement intellectuel, d'un progrès analogue dans les esprits ; l'amélioration sociale semble précaire, inexplicable, presque illégitime."—Guizot, *Histoire de la Civilisation en France*, i. 7.

" A great degree of social improvement, a great advance in material prosperity, if they manifest themselves amongst a people without being accompanied by a corresponding mental progress, the social improvement appears precarious, unaccountable, and scarcely legitimate."

paru que, de l'avis général, la civilisation consistait essentiellement dans deux faits ; le développement de l'état social, et celui de l'état intellectuel ; le développement de la condition extérieure et générale, et celui de la nature intérieure et personnelle de l'homme ; en un mot, le perfectionnement de la société et de l'humanité.”\*

“ It appears to me that by general consent civilisation is contained in two facts, the development of the social and intellectual condition—that of the exterior and general relations, and of the interior and personal nature of man ; in one word, the perfecting of society and humanity.”

These definitions are clear and intelligible, but to express my own idea it is necessary to add a word or two. Civilisation is to the body politic, what culture is to the individual, which consists, I venture to think, in the due and proportionate development of all his faculties, physical, intellectual, emotional and moral ; and in proportion as any of these are neglected, the culture or civilisation will be imperfect, abnormal, and incomplete.

Before proceeding to speculate on the future, it is necessary to take a brief glance at the past. The course of the world's history has not been spasmodic or paroxysmal, but connected by cause and effect from a period far beyond the reach of human history or tradition. In times far remote from the present, civilisation existed, in certain relations of a very high character, the influence of which is felt at the present day, and will probably be perpetuated to the end of time. The course of human thought and progress has been so far shaped and modified by what has gone before, that the present and future can only be very imperfectly understood without a proper appreciation of the past. So much has been written about ancient civilisation, that it will only now be necessary to take a rapid survey of its most salient features.

\* *Histoire de la Civ.*, i. 6.

Ancient civilisation was essentially Greek in its origin. Here I cannot help quoting from a recent lecture by Sir Henry Maine, a passage which most eloquently and truly describes the relation of Greece to the progress of the world. He says, " Whatever be the nature and value of that bundle of influences which we call 'Progress' . . . there was only one society in which it was endemic, and, putting that aside, no race or nationality left entirely to itself appears to have developed any very great intellectual result, except, perhaps, poetry. Not one of those intellectual excellencies which we regard as characteristic of the great progressiveness of the world—not the law of the Romans; not the philosophy and sagacity of the Germans; not the luminous order of the French; not the political aptitude of the English; not that insight into physical nature to which all races have contributed—would apparently have come into existence if these races had been left to themselves. To one small people, covering in the original seat no more than a handful of territory, it was given to create the principle of progress, of movement upwards, and not backwards and downwards—of destruction tending to construction. That people was the Greek. Except the blind forces of nature, nothing moves in this world which is not Greek in its origin. A ferment spreading from that source has vitalised all the great progressive races of mankind, penetrating from one to another, and producing results accordant with its hidden and latent genius, and results of course, often far greater than exhibited in Greece itself."

Now, Greek civilisation was essentially aesthetic in its character, and gave a similar tone to the culture of the ancient world. All the surroundings of Greek life were marked by the most exquisite taste. Their architecture displays a refinement of form and proportion elsewhere sought in vain. Their sculpture, in its dignified repose and

quiet beauty, puts to shame the noblest works of all succeeding times. Whoever has visited the Museo Borbonico at Naples will bear witness to the elegance of form impressed even upon the humblest instruments of daily household life. Their ceramic manufacture was carried to the highest pitch of perfection. In the extremely difficult and delicate process of gem engraving, modern efforts, with all the appliances of optical and mechanical science, toil after the ancients in vain. The poets, historians, and dramatists of Greece are acknowledged by all subsequent ages to be the purest models of style which the world has ever seen.

To a lesser extent, the same æsthetic development derived from this source pervaded the Roman empire, and has stamped upon ancient culture a character all its own.

In purely intellectual philosophy, the ancient schools, though not possessing the same pre-eminence, sounded the depths of human nature, and soared as high in mental speculation as any of the moderns have been able to reach. The brilliant galaxy of Athenian philosophers, who, in the fifth century before our era, rendered the groves and porticoes of Athens for ever memorable, left no line of purely mental inquiry unexplored.

Closely connected with mental science stands ethical philosophy, which the ancients prosecuted with a zeal and earnestness worthy of all commendation. The stoical theory of ethics established by Zeno, and subsequently developed by Epictetus, Seneca, Cicero, and Marcus Aurelius, was in many respects one of the noblest achievements of unaided human wisdom. The eloquent historian of *European Morals* thus characterises the principles of stoicism: "This school of philosophy furnishes the most perfect of all historical examples of the power which the higher motives can exercise over the mind. The coarser forms of self-interest were in stoicism absolutely condemned. It was one of the first prin-

ciples of these philosophers that all things that are not in our power should be esteemed indifferent ; that the object of all mental discipline should be to withdraw the mind from all the gifts of fortune ; and that prudence must in consequence be altogether excluded from the motives of virtue."\* "Pleasure," they argued, "is the companion, not the guide, of our course." "We do not love virtue because it gives us pleasure, but it gives us pleasure because we love it." Man's end, according to these teachers, is not to find peace either in life or in death. It is to do his duty, and to tell the truth. †

In addition to mental and moral philosophy, jurisprudence and law occupied a high place in ancient civilisation, especially under the Roman empire. The jurisprudence and civil rights at the present day, throughout the greater part of Christendom, are based upon the Roman laws, still appealed to for the principles therein laid down, which have never been superseded.

These are a few of the points at which the civilisation of the ancient world reached a high standard ; but it was accompanied by many shortcomings. Whatever might be its merits, they were enjoyed by a very small portion of the community. In Rome, a large proportion of the people, and in Greece, a still larger, were slaves ; and though it is true that of these some were educated, and have even immortalised their names, the great majority were in a state of brutal ignorance. Even amongst the members of the body politic, education and refinement penetrated to a very limited extent. According to the description of Gibbon—"From the stately palaces (of the baths) issued a swarm of dirty and ragged plebeians, without shoes and without a mantle, who loitered away whole days in the street or Forum, to hear news and to hold disputes ; who dissipated in extra-

\* Lecky, *Hist. Europ. Morals*, i. 190. + *Ibid.* i. 197.

vagrant gaming the miserable pittance of their wives and children ; and spent the hours of the night in obscure taverns and brothels, in the indulgence of gross and vulgar sensuality."

Again, the area of ancient civilisation was extremely limited in its extent. Before Greece and Rome became eminent, the primitive cultivation of Assyria and Egypt had become effete, and down to the latest period a narrow fringe round the Mediterranean Sea contained all that the world possessed of literature, art, science, and philosophy.

The material progress of the ancient world was limited and checked by their comparative unacquaintance with the powers of nature. The expansive and explosive forces latent around us, which have multiplied a thousand fold the means at man's disposal, were utterly unknown. Machinery, in any proper sense of the term, did not exist. Even at the most refined period of the classical ages, the corn had to be laboriously ground by hand for the daily supply of bread. Education was necessarily limited by the expense and scarcity of the manuscripts which supplied the place of modern books. Although the exact sciences were carried to a high pitch of cultivation by the ancient philosophers, yet the study of the higher mathematics was limited by the want of a suitable method of calculation, and by the cumbrous mode of giving expression to numerical problems.

Natural philosophy was necessarily cramped and dwarfed in its development by the mistaken methods adopted of arriving at the truth. Experimental enquiry, the great source of modern successful progress in every branch of knowledge, was almost unknown. The deductive and synthetical system, which reasoned from an assumed cause to what it was supposed ought to be the result, filled the place of the modern inductive principle of analysis, which first observes, then generalises, and traces the line of sequences

to their ultimate origin. Hence the limited knowledge of physiology and of the human frame, and the adoption and rejection of successive hypotheses to account for every phenomenon in nature.

The ancient systems of administration and government, amongst much which was admirable, were deficient in the essential elements of permanence. The idea of the unity of the body politic, of equal rights to every member, of the interest of each being the interest of all, seems never to have been reached. Hence the history of Greece and Rome is the record of a perpetual struggle for ascendancy on the one hand, and for emancipation and recognition on the other. The elements of society never thoroughly coalesced and amalgamated into an harmonious whole. The result was a chaotic confusion and looseness of texture, so to speak, which rendered the whole fabric liable to dissolution on the application of any external force.

One of the most serious defects in ancient civilisation was on the emotional and sympathetic side. The natural instincts of humanity, so far as related to the family affections, no doubt were in exercise, though even these were on occasion sternly repressed by the influence of a false philosophy; but that wider scope of sympathy developed in modern times, which extends a helping hand to every form of human suffering, was altogether unknown.

"In spite of the casual efforts of some of the better emperors in this direction, no permanent institution for the relief and gratuitous maintenance of the suffering, the refuge of the infirm and aged, or the reclaiming of the fallen—nothing corresponding to our hospitals, almshouses and asylums—existed amid the civilisation of the Roman empire. Antique heathenism had neither the idea nor the word to express charity in anything like our acceptance of its profound meanings."\*

\* *Saturday Review*, June 19, 1875.

"Friendship rather than love, hospitality rather than charity, magnanimity rather than tenderness, clemency rather than sympathy, are the characteristics of ancient goodness." \*

Stoicism, which was the noblest impersonation of antique virtue, declared war against the whole emotional side of our being, and thus led to the extirpation of the feelings which nature intended as the chief springs of benevolence. Men who refused to recognise pain and sickness as evils, were scarcely likely to be very eager to relieve them in others.

But the greatest blot on the civilisation of old was the want of a high and true moral standard. In the earlier and purer days of Greece and Rome, patriotism was accounted the highest virtue, and many noble examples exist of self-devotion on behalf of their country. To this succeeded, at least amongst the leading classes a deep sense of honour—of shame at doing anything mean or unworthy. This was the ideal of the virtuous man, as drawn by Horace :

" Justum et tenacem propositi virum  
 Non civium ardor prava jubentium  
 Non vultus instantis tyranni  
 Mente quatit solidâ, neque Auster  
 Dux inquieti turbidus Adrise  
 Nec fulminantis magna Jovis manus ;  
 Si fractus illabatur orbis  
 Impavidum ferient ruine. †

\* Lecky, *Hist. Europ. Morals*, i. 200.

† Horace, *Od. iii. 8-1.*

The man in conscious virtus bold,  
 Who dares his secret purpos hold,  
 Unshaken hears the crowd's tumultuous cries,  
 And the impetuous tyrani's angry brow defies.  
 Let the wild winds that rule the seas,  
 Tempestuous all their horrors raise ;  
 Let Jove's dread arm with thunders rend the spheres,  
 Beneath the crush of worlds undaunted he appears."

The best examples of virtue left us by the ancients are built upon a lofty idea of the dignity of human nature, and thus exhibit only a kind of majestic egotism, which frequently fell in practice far short of its professions. Vices which are now stigmatised as degradation of the lowest kind, were unblushingly indulged in without rebuke, even by philosophers of high pretensions. Religion and morality had no connection with each other. The popular mythology, illustrated by the poets, described the gods as indulging in unbridled sensuality, deception, cruelty and falsehood, and in many of the religious celebrations, orgies of the most detestable character were considered an essential part of the services. The picture of Roman society drawn by St. Paul, in the first chapter of the Epistle to the Romans, revolting as it is, is fully justified by the descriptions of the writers of the time. This state of things was aggravated by the vicious extravagances of many of the emperors; by the venality and turbulence of the Roman populace; and by the cruelty of the gladiatorial shows; until it seemed as if the bonds of society were loosened, and the whole fabric was tottering to its fall. No normal standard existed, to the ideal of which the more earnest spirits might aspire. No authoritative sanction was on record, stamping virtue with the approval of a higher power. Mankind were sinking into a slough of despond from which there appeared no way of escape.

There can be no question that the advent of Christianity materially hastened, if it was not the main cause of, the breaking up of the ancient system of civilisation. Like the wonderful image seen by Nebuchadnezzar in his dream, this system presented a complete and organised whole. The aesthetical portion, the arts, the poetry, the literature formed the head of gold, surrounded by a halo of glory which will never pass away. The arms and trunk, of silver and brass, aptly typified the philosophy, the laws, the jurisprudence of

the ancient world ; but the substructure of iron and clay, on which the whole was based, representing the religion and morals of the period, formed a crude combination of friable material utterly without union or cohesion. Against this, the most wonderful fabric ever reared by human skill, the stone cut out of the mountain without hands impinged by a force not its own, and the gold and silver, the brass, iron and clay crumbled into a chaos of irretrievable ruin. There was no help for this. The civilisation of the ancient world was closely and intimately connected with its religious beliefs. "The religion of the nations was not merely a speculative doctrine, professed in the schools or preached in the temples. The innumerable deities and rites of polytheism were closely interwoven with every circumstance of business or pleasure, of public or private life ; and it seemed impossible to escape the observance of them, without at the same time renouncing the commerce of mankind, and all the offices and amusements of society." "The philosopher, who considered the system of polytheism as a composition of human fraud or error, could disguise a smile of contempt under the mask of devotion, without apprehending that either the mockery or the compliance would expose him to the resentment of any invisible, or, as he conceived them, imaginary powers. But the established religions of Paganism were seen by the primitive Christians in a much more odious and formidable light. It was the universal sentiment of the church that the demons were the authors, the patrons, and objects of idolatry."\*

Loyalty to the truth was the first maxim of Christianity, in the balance against which all the culture, art, and philosophy of accumulated ages was but as a feather weight. The disintegrating influence of Christianity was supplemented by the irruptions of the barbarian hordes, and the result was,

\* Gibbon, *Decline and Fall*, chap. xv.

from the sixth to the eleventh century of our era, a state of society combining every element of disorder, rapine, misery and barbarism. The discipline was a sharp and severe, but necessary one. Out of this chaos slowly arose the stately form of modern civilisation, with its grand proportions, its noble aims, its all-embracing sphere of inquiry, and the motto of progress emblazoned in living characters on its front. It is not within my province to detail the successive steps by which our present vantage ground has been gained. We will accept the position with gratitude. We are heirs of all the ages, of the accumulated wisdom of all time; but with the treasure we have inherited the responsibility. Let us examine our present position, and inquire what are the characteristics and tendencies of modern civilisation, and the future to which they point.

"Not in vain the distance beacons. Forward, forward, let us range,  
Let the great world spin for ever, down the ringing grooves of  
change."

The first and most characteristic feature of modern civilisation is its mastery over the powers of nature, and the utilisation of its forces. In this respect the last century has done more for mankind than all previous ages. Physical power in this sense was almost entirely unknown to the ancients. The wonderful agency of heat, acting through the expansive force of water in the form of steam, has multiplied man's physical strength many thousand fold. Collaterally this has led, by stimulating invention, to various other discoveries, extending the dominion of man over nature. Many of these, such as gunpowder, the mariners' compass, and the invention of printing, preceded by ages the application of steam power; but each of these inventions has since been developed to an extent which without this would have been impossible. There is not a department of human

industry into which this element of physical power does not largely enter. We see it developing more and more every day, and there is no limiting the extent to which it may be carried. Now, apart from all adventitious circumstances, what should we expect as the natural result of this enormous accession of physical power? Supposing the human race were all one family, toiling painfully for sustenance with the feeble strength with which Nature has endowed our bodies, and each interested in the welfare of all, and a common partaker in the general benefits; and suppose that a discovery were made which, whilst lessening labour by one half, at the same time doubled production, it is obvious that the result would be either a greatly diminished necessity for labour, or a greatly increased share for each in the comforts and conveniences of life—probably a combination of both these advantages. We must not lose sight of the fact, that notwithstanding all the complications of society, and the vast gulf which seems sometimes to yawn between the higher and the lower classes, between the prince and the peasant, the capitalist and the artisan, there are links which bind us all together, which cannot be broken. The lowest claims his right to sustenance in exchange for his labour, and the highest has duties and responsibilities which he cannot shirk if he would. What are the strikes, the picketings, the lock-outs in the manufacturing world, the uneasy ground-swell in the agricultural districts, but crude attempts to solve the problem of the share in the national stock which belongs to each? Capital and labour, which ought to be as united as the "Great Twin Brethren" who fought so well for Rome, bitterly contend for their share of the spoils which their joint industry has won. How is the great contest to be settled? What are the tendencies of modern progress in this direction, and what is the future of industry to be? There are a few symptoms which present themselves to those

who can look beneath the surface shewing the direction of the current, and a few warnings of rocks and shoals which lie ahead to which we should do well to take heed.

If we compare the condition of the working man of to-day with his predecessor a century ago, or at any previous period, I think there can be no question that in exchange for his labour he now gets a larger *amount* of the comforts of life. I do not say a larger *share* of the general stock, for that depends on the solution of the question whether he has advanced at the same pace as the general mass of society. All ranks have benefited by man's modern command of power. Here I touch on a somewhat delicate question, but it is one which must be faced. None will dispute the fact that it is industry which has so enormously increased the wealth of this and all other civilised countries in modern times, increasing in ever accelerated ratio. Now it will not be going too far to say that the largest proportion of this benefit has been derived by the owners of fixed property, especially by the proprietors of large landed estates, which have increased in value without any care, forethought, effort or industry on the part of their owners. No one with any regard to the welfare of the country would grudge such fortunate individuals their ever increasing possessions, but it would be well for them to consider that it is possible to push the rights of property so far that a reaction might take place. Time will not permit me to give more than a single illustration. A considerable portion of London is held on leases for limited terms from large landed proprietors, at the expiration of which terms, the property, with all its erections, and the enormous increase which industry and labour have imparted, reverts to the lessor, who has never expended one shilling upon it. It is in vain to say that this is free contract between buyer and seller, since the article is a monopoly for which the possessor can exact his own terms. Cases

of this kind indicate dangers which may be avoided by timely consideration.

We cannot suppose that we have reached the utmost limit of man's command over the powers of nature. Fears have been entertained, perhaps well founded, that the supply of coal, the great instrument for producing power, may fail; but there are other forces in store, scarcely as yet tried. Magnetism and electricity lie ready to man's hand to an illimitable extent; and science is almost daily lifting the veil which has hitherto concealed many of the vast resources which lie waiting to be appropriated.

The question then stands thus. Physical science is constantly on the advance, and must continue to increase the general stock of production, the common property of society. The distribution of these advantages must depend on a variety of circumstances, some patent, others occult, such as the state of education, political institutions, the pressure of population, the standard of comfort, &c. There never was a period when wealth accumulated to a greater extent amongst the upper classes in our own country; but in some other countries the institutions tend to prevent this, and to increase the influence and position of the middle and artisan classes. On the whole, so far as concerns Christendom, the prospect is hopeful, and there is every reason to believe that the progress of science and invention will tend to benefit humanity as a whole.

To physical progress we owe the modern facility of intercourse; and never in the history of the world were such advances made in this direction as at the present day. Isolation is unfavourable to development. The narrow circle of ideas proper to any single community tends to harden into a barrier of prejudice, which can only be broken down by the interchange of thought from other sources. Civilisation entirely self-developed is almost unknown in the

annals of the human race. The Romans were the great road makers of antiquity. From the eternal city as a centre, there radiated in every direction substantial well-constructed thoroughfares, connecting the extreme limits of the empire, more than four thousand miles from one extremity to the other. No sooner was a country or district colonised or conquered, than the industrious cohorts were set to work; bridges were built, valleys raised, mountains perforated, and lines of communication established, many of which remain perfect to the present day. The uniformity of character stamped upon the Roman Empire was due in a large measure to this facility of intercourse.

What the Roman road was in comparison of the sheep track or mule path which it superseded, such is the modern railway in relation to the Roman road, but in a far higher degree.

It would be difficult to over estimate the advantages possessed in modern times by the introduction of the railway and the steam boat. They have changed the map of the world; they have altered the boundaries of states; they have revolutionised the art and practice of war; they have given new directions to trade and commerce. They have opened up new channels of industry; shortened by thousands of miles the great lines of communication; and when to these we add the most marvellous achievement of modern science, the telegraph wire, which practically annihilates time and distance, the present age seems separated from that which preceded it, not by an interval of years, but by cycles of time.

What then are the tendencies and prospects presented by these unexampled facilities of intercourse? One certain result must be the breaking down of the prejudices which have operated as barriers, keeping aloof the different branches of the human family. A striking illustration of this recently

occurred in the banquet given in July last by the Lord Mayor of London to the civic dignitaries from all parts of Christendom, when the Mayor of Quebec sat side by side with the Burgemester of Bergen, the Syndic of Rome toasted the Lord Provost of Edinburgh, and the Prefect of the Seine was welcomed as representative of the municipal institutions of a people formerly considered our natural enemies.

By means of this improved intercommunication, the ideas and principles of the different races and peoples interpenetrate and react on each other; all begin to find they have something to learn; the natural antipathies which repel are found to be baseless, and give place to the kindly sympathies which attract the different members of the human family.

Perhaps the most remarkable example of this collapse of the barriers of prejudice is to be found in the revolution which has taken place within the last few years in the ideas and relations of the Japanese people. In a condition the most isolated and most repellent of all foreign intercourse of any nation in the world, finding the force of circumstances too strong to resist, they have accepted the situation, thrown prejudice to the winds, and are now as eager to come to the front in the race of modern progress as they were formerly earnest in resisting all advances.

Closely connected with the improved intercourse of modern times is the colonisation of the world. The earliest colonisers of whom we have any record were the Phœnicians, who were the pioneers in extending westward the commerce and culture of the east. After them came the Greeks, perhaps the most skilful colonists of any period, who surrounded the Mediterranean basin and the Adriatic with Commonwealths imbued with the arts and literature of the mother country, the influence of which has endured even to the present day. The Romans were no colonists in the

proper sense of the term, although we get the name from them. They were conquerors, not planters; yet even amongst them the colony was an institution of great utility and power. Their colonies were intended to keep in check a conquered people, and to act as outposts to maintain the ascendancy of the Roman empire. The colonists had all the privileges of Roman citizens; each colonia was in its institutions a transcript of the Imperial city from which its authority was derived; and there can be no question that long after the irruptions of the barbarians, when Gaul and Spain and Lombardy were subjugated and reduced to servitude, the institutions of Rome survived in the cities which were established as Roman colonies.

After the discovery of America, Spain and Portugal naturally took the lead in colonisation. From this source, Central and South America have derived, for good or for evil, their character, their language, their religion, and their institutions. Holland and France next came into the field, the former in the Cape Colonies, Guiana, West Africa, and the spice islands of the East, and the latter in the wide expanse of Canada, and in the West India islands. England was last in the field, but has cultivated it to a greater extent and with a more successful result than is elsewhere found; nor is it now possible for any other nation to overtake us in the race. In this category I of course include the United States, kindred in origin, language, and institutions. At the present day, the English-speaking race are the only colonisers. Over the continent of America, north of the Gulf of Mexico, their influence is predominant; the islands of the Pacific, the vast continent of Australia, own their sway. Africa in its southern portion is part and parcel of the British empire; India with its teeming millions owns our Queen as its empress; and British Burmah is drawing us nearer to the confines of the far east. We might thus far

say that England is at the present day the only colonising nation ; but here we are confronted with the irrepressible expansive power of another race, utterly diverse in all its aspects and character, but which of late years has developed a marvellous capacity for colonisation and extension. The Chinese, who constitute in numbers one-fourth of the human race, impelled probably by misgovernment and poverty at home, are pushing out their surplus population amongst the islands of the Indian Ocean, the West Coast of America, and the English settlements in Australia. This emigration is likely to continue in an accelerated ratio, and may be fraught with most important results. The Chinese are an ingenious, industrious, thrifty and peaceable race, who will thrive where a European would starve, but who in the event of their ascendancy would be found treacherous, cruel, and unprincipled. The result of the competition of the Western race, few in numbers, but strong in native and acquired force, with the countless hordes of the weaker race, endowed with native capacity and skill, but weak in energy and power, is a problem which time alone can solve. The present and increasing facilities of intercourse are rapidly bringing to a point the issues involved.

From this we are naturally led to the influence of language on the future destinies of the world. There is nothing to which a people cling with more pertinacity than their mother tongue ; yet history tells us that repeatedly, in the course of ages, the language of entire countries has undergone a thorough change. Spain, Portugal, and France, inhabited by Celtic and Iberian populations, adopted almost entirely the language of their conquerors ; and many dialects, such as the Cornish and Pictish, have died out and left no trace behind. The languages of modern continental Europe have little room for expansion. German, French, and

Italian are not likely in future ages to be spoken by much larger populations than at present. Spanish and Portuguese will be preserved and extended by the republics of Spanish America and the Empire of Brazil, the growth of which is slow and feeble. But contemplate the future of the English tongue. At the present day it is spoken by upwards of ninety million souls. From the Atlantic to the Pacific, and from the Gulf of Mexico to Labrador, it is the predominating language. In the islands of the Pacific, the broad plains of Australia and Tasmania, the Cape and African Colonies, it is the mother tongue, and over the vast empire of India its influence is yearly increasing. In another century, there can be little doubt that the English language will be spoken by two hundred millions of people. Consider for a moment what this implies. Language is not the mere vehicle of communication between individuals. Language means literature, ideas, modes of thought, laws, institutions. Whatever race a man belongs to by birth, let him be affiliated into a society by a common language and he imperceptibly and necessarily imbibes the principles and modes of thought of those amongst whom he moves. With advancing education, the recorded literature obtains more and more influence, and gives character and expression to the ideas of the race. We see this strikingly exemplified in the United States of America. A very large proportion of the immigrants belong to alien races, but it is found that, after a generation or two, every distinctive mark of origin is obliterated, and the traits of the original English Puritan character take their place. Whatever races may in the future compete in point of numbers with those of Anglo-Saxon descent, the seeds of progress and improvement scattered broadcast over the world from the rich stores of English literature must have a predominating and beneficial influence. What a future is here opened up for English writers of coming generations!

" Of those that eye to eye shall look  
 On knowledge ; under whose command  
 Is earth and earth's, and in their hand  
 Is Nature, like an open book."

From this little island as a centre, a key-note struck shall reverberate and bring out a harmonic response from the remotest regions of the globe. Truth and justice, freedom and right, wisdom and knowledge cannot but be gainers by the extension of our language and literature.

" Ultima Cymaei venit jam carminis aetas ;  
 Magnus ab integro saeclorum nascitur ordo.  
 Jam redit et Virgo, redeunt Saturnia regna."\*

There is only one other language and people which give the promise of wide extension in time to come ; I mean those of the Russian empire, as representative of the great Sclavonic race. That there is a great future for this race in the extension of order and civilisation over the vast extent of Northern Asia with its nomadic population, there can be no doubt, but its mission is marked out and limited by nature and circumstances, and will scarcely interfere with other European influences for many ages to come.

The intellectual future of the world will necessarily be affected to a very large extent by the amount and kind of education imparted to the masses. On this I have only a word or two to offer. That education will advance, and in its general practical influences be brought within the reach of all, is a settled point ; but, from the vast area of the field which knowledge now occupies, there is a fear that for the

\* Virgil, *Ec.* iv. v.

" The last great age foretold by sacred rhymes  
 Renews its finished course ; Saturnian times  
 Roll round again ; and mighty years, begun  
 From their first orb, in radiant circles run."

majority what education may gain in breadth it may lose in intensity. We must, however, resign ourselves to the inevitable, satisfied that, on the whole, the human race will be immeasurably the gainers.

What will be the prevailing system of government in future ages is a problem which has frequently occupied speculative minds, and various solutions have been propounded. A few indications present themselves to our view. In our own highly favoured land, we have come to enjoy such a degree of settled liberty under a constitutional monarchy, that we naturally conclude it is the only—or at least the best—mode of reconciling order and stability with individual freedom and rights ; but, if we look around us, we cannot but see that England is almost the only country in which this system has been completely successful. In the neighbouring countries belonging to what are called the Latin races we see a constant alternation between imperial despotism and democratic license, which is only despotism under another form. It must undoubtedly be admitted that if an educated community had for the first time to choose its government, it is not probable that it would take the form of a monarchy. The United States of America set the example. However loyal our colonies may be to the mother country, circumstances may easily arise which would lead to a separation, and no one could for a moment suppose that any of them would elect a king to reign over them. A constitutional monarchy is only possible when the line of succession is hallowed by tradition and cherished historical associations, where there is an aristocracy so far respected as to exercise a regulating influence on public affairs, and above all where there is mutual forbearance and aversion to sudden change :

“ Where Freedom slowly broadens down  
From precedent to precedent.”

The late Richard Cobden was of opinion that, under the benign influences of free trade, war and contention would cease, and that the government of the future would ultimately resolve itself into an agglomeration of self-governed municipalities, without the necessity of a common centre. This is scarcely probable or desirable. There are many cases in which justice, morality, self-preservation, and progress require a nation to act as a whole. I am no prophet, and can only indicate what appear the tendencies of human affairs. England will long preserve her admirable constitution, under which she has attained to so high a degree of prosperity and success; but her daughter colonies, which have developed under such different auspices, will not follow in the steps of their parent, and in the world's future government this cannot but have a very important and decisive influence.

With the progress of enlightenment and the increased influence of reason on the minds of men, is it probable that within any definite period wars will cease? This has been a favourite vision from the time of the old Hebrew prophets, who saw from afar the time when "nation shall not lift up sword against nation, neither shall they learn war any more," down to the period of international exhibitions and free-trade demonstrations. Apparently, in recent times, the evil, so far from being extenuated, has been greatly aggravated. Never were such multitudes brought into the field; never was science so laid under contribution, or were operations conducted on so grand a scale for the destruction of human life as in the late Franco-German war. The vast preparations continually kept up familiarise the mind with war as the normal state of things, and naturally lead to it on the slightest occasion.

"How oft the sight of means to do ill deeds  
Makes ill deeds done!"

Yet, if we look below the surface, there are symptoms which unmistakably point towards a reaction. The very perfection of warlike means may possibly stultify their ends. The enormous costliness of a campaign to those engaged in it, whether victors or vanquished, necessarily shortens its duration. Contests like those of the thirty years' war in Germany, or the European conflict arising out of the first French Revolution, are now impossible. The exhaustion of the resources of the combatants would bring the war to a close within a very limited period.

It has been common to attribute all the evils of war to the governments of the countries engaged. Cowper says—

"But war 's a game, which, were their subjects wise,  
Kings would not play at."

This, however, in modern times at least, is a fallacy.

The late war between France and Germany, and the civil war in America, were eminently contests stimulated by popular feeling, and supported by public enthusiasm. Such being the case, we cannot help anticipating that a time will arrive, with the increased intercommunion and better acquaintance of the peoples, when bitterness and prejudice will cease, and the causes of war will die out.

At the same time, it is not to be expected, nor indeed to be desired, that the resort to war as the ultimate appeal when great principles are at stake should be superseded. War is so dreadful a calamity, and brings so many horrors in its train, that any apology in its behalf may seem inhuman and paradoxical, yet in a choice of evils there are worse things than war. Slavery is worse; tyranny is worse; religious persecution is worse; slothful submission to corruption and degradation is worse. There have been national uprisings against oppression and wrong which are justified by the holiest and noblest sanctions.

Mr. Lecky says—" War, which brings with it so many demoralising influences, has at least always been the great school of heroism. It teaches men how to die. It familiarises the mind with the idea of noble actions performed under the influence, not of personal interest, but of honour and of enthusiasm. It elicits in the highest degree strength of character, accustoms men to the abnegation needed for simultaneous action, compels them to repress their fears and establish a firm control over their affections. Patriotism too leads them to subordinate their personal wishes to the interests of the society in which they live. It extends the horizon of life, teaching men to dwell among the great men of the past, to derive their moral strength from the study of heroic lives, to look forward continually through the vistas of a distant future to the welfare of an organisation which will continue when they have passed away."\*

Those who, with the best intentions, are opposed to war on any occasion and for any cause, are apt to forget that all human laws are based in the last resort on physical force. The policeman who protects our life and property, the officer who arrests the culprit, the judge who pronounces sentence; the legislature which makes the laws, and the officers who administer them; are assured in their respective vocations by the reserve of physical force always at command, without which society would run to disorder, and would be at the mercy of the evil disposed.

In the intercourse between independent nations there is no common power to which to appeal. The arbitration which is so often referred to may serve to adjust a disputed boundary, or to settle the terms of a claim for pecuniary damages, but in matters of vital principle it would be rejected with contempt. Can any one suppose that questions like

\* *Hist. Europ. Mores*, i. 198.

the cession of Alsace and Lorraine, or the independence of the United States, would ever be submitted to arbitration? War then must, so far as we can see, be a power kept in reserve to be appealed to in the last resort. Under present circumstances, with its increasing cost and difficulties, it is not likely to be lightly resorted to; and the great occasions on which it would be inevitable will probably diminish with time.

A few words may suffice on the esthetical aspect of modern civilisation. In those departments which were the peculiar excellence of the ancient world, the moderns cannot compete. We have no sculpture to equal that of Phidias and Praxiteles; no refinement of architectural forms to equal the Parthenon; no ceramic elegance of production, or application of beauty to ordinary implements such as prevailed under Greek influences. We have no epics like those of Homer, no dramas for intensity and power to equal those of Sophocles and Euripides, no odes like those of Horace, no eloquence to compete with Demosthenes and Cicero, no histories like those of Thucydides and Tacitus. In style, the ancients stand upon an eminence unapproachable by the moderns.

There are, however, a few points on which modern art may be fairly said to have marked out a path of its own. The love of nature, both in art and poetry, is almost entirely of modern growth. Horace, in his "Art of Poetry," makes no reference to external nature as an object of study. Virgil's love of the country breaks out from time to time in verses which make something of an approach to modern susceptibilities. In the second Georgic, for instance, after the well-known apostrophe—

"O fortunatos nimium, sua si bona nōrint,  
Agricolas;"—\*

\* "Oh! happy, if he knew his happy state,  
The swain."

occurs the following passage :

" Speluncae, vivique lacus ; at frigida Tempe,  
Mugitusque boum ; mollesque sub arbore somni  
Non absunt ; illic saltus ac lustra ferarum." †

Other passages of similar character might be quoted, showing that Virgil almost stands alone amongst the ancients in his appreciation of natural scenery.

This sympathy with nature was of slow growth amongst the modern poets. In Dante and the great Italian poets of the fifteenth and sixteenth centuries there is very little of it exhibited. Samuel Taylor Coleridge says of them—" Their imagery is almost always general ; sun, moon, flowers, breezes, murmuring streams, warbling songsters, delicious shades, lovely damsels, nymphs, maids, and goddesses are the materials which are common to all, and which each shaped and arranged according to his judgment or fancy, little solicitous to add to or to particularise."

To our own poets may fairly be ascribed the honour of having led the way in the modern appreciation of nature. Chaucer has some exquisite descriptions of natural phenomena. Shakespeare, on this as on every other subject, is eminent for truthfulness of delineation and poetical personation. Milton's descriptions of natural scenery fall like rich music on the ear ; and from thence onwards in Dryden and Pope, and Gray and Cowper, and Thomson and Scott, and Wordsworth, and Shelley; and Tennyson, we have an appreciation of natural beauty, and an expression of its harmonies and sympathies with human nature, unsurpassed in any language or literature.

† " Cool grot, and living lakes, the flowery pride  
Of meads, and streams that through the valley glide,  
And shady groves that easy sleep invite,  
And after toilsome days a sweet repose at night.  
Wild beasts of nature, in his woods abound."

This again has reacted on Modern Art. Landscape painting was unknown in the ancient world, and in modern times could scarcely be said to have an existence before the time of Claude Lorraine and Poussin. At the present day, poetry and painting vie with each other in their subtle insight into the rich analogies of nature with the human mind, and a source of pleasure, refinement and elevation has been opened which was utterly veiled from the world of antiquity. There is no reason to believe that this will slacken in its intensity or diminish in its quantity, and it must contribute largely in the future to the education of the world.

A very pleasing feature of modern civilisation as compared with the ancient is the far larger amount of sympathy with human suffering. When we read in ancient history, both sacred and secular, of the little regard manifested for human life; of the massacres of entire peoples; of the sacking and burning of towns, and the reduction to slavery of the inhabitants; when in the time of calamity, of plague and pestilence, of fire and tempest, little or no effort appears to have been made for the relief of the sufferers, we seem as if reading of another and alien race of beings. The sentiment put by Terence into the mouth of one of his characters,

"Homo sum; humani nihil a me alienum puto."<sup>\*</sup>

is quoted by Cicero as an expression very extraordinary and remarkable.

Whatever might have been the case in former times, lack of human sympathies is not one of the vices of the present age. There is scarcely one of the ills which flesh is heir to which has not provision made for its alleviation; scarcely a calamity which occurs, whether it be a famine in a distant part of the

\* "I am a man, and feel for all mankind."

world, or an inundation in a neighbouring country; a mine explosion, a cotton famine, or a potato rot at home, that a sympathetic feeling is not immediately called forth, and organised efforts put forward in relief. War, hateful as it is, has its horrors alleviated by generous liberality and active self-denying devotion. No sooner is a soldier struck down, than from an enemy to be sacrificed he is converted into an object of compassion to be relieved. This is one of the noblest and most promising aspects of modern times, and contrasts very favourably with every period which has gone before. It is not probable that this feeling will diminish. Our outlook into the future is cheered and brightened by the glow communicated by the warm sympathies of the human heart.

I have left to the last a few thoughts on the most important element in any prospect of the world's future—the influence of religion. The subject is fraught with difficulty, but it cannot be omitted in any general view such as we are now taking. I have no desire to enter into polemics. Dogmatism, and even theology, would be here entirely out of place. Yet I think it may be possible to consider the question from a philosophical point of view, irrespective of special creed or dogma.

During every period of the world's history, religion has played an important and influential part. There is in the mind of man an irrepressible instinct yearning after the spiritual, the unseen, and the future. There is hardly a savage race so degraded in which this feeling does not develop itself in some fantastic form. If we extend our researches as far back as it is possible to go into the early history of the human race, and by analogy into the dim prehistoric period replete with shadowy outlines and strange fantastic forms, we find that religious and moral aspirations were closely connected, and mutually influenced each other.

As we proceed onwards, we find this connection gradually loosening, and finally almost entirely dissolved. "One of the first facts that must strike a student who examines the ethical teaching of the ancient civilisations is how imperfectly that teaching was represented, and how feebly it was influenced, by the popular creed. The moral ideals had at no time been sought in the actions of the gods, and long before the triumph of Christianity, polytheism had ceased to have any great influence upon the more cultivated intellects of mankind."<sup>\*</sup>

The introduction of Christianity restored that connection which was one great element of its success. As stated by Gibbon: "The primitive Christian demonstrated his faith by his virtues; and it was very justly supposed that the divine persuasion which enlightened or subdued the understanding, must at the same time purify the heart, and direct the actions of the believer. The first apologists of Christianity who justify the innocence of their brethren, and the writers of a later period who celebrate the sanctity of their ancestors, display in the most lively colours the reformation of manners which was introduced into the world by the preaching of the gospel."<sup>†</sup>

It is not within my province to enter into the history of the Christian Church in its relation to the world. It is rather my task to consider the phenomena which present themselves to our view at the present time.

If we take a general survey, we find there are four religions which exercise a large and powerful influence in the world, viz., Brahmanism, Buddhism, Mahometanism and Christianity. I omit from the category the fetichism and grovelling superstitions of the few remaining savage races, which soon die out when brought into contact with those more advanced. Upon each of these I will say a few words.

\* Leaky, *Hist. Europ. Morals*, i., 169.

† *Decline and Fall*, chap. xv.

Brahmanism is the lineal descendant of the original Aryan nature-worship, which exhibits in the Vedic hymns and other early productions many noble sentiments and spiritual aspirations. According to its doctrines when further developed, the visible world is the transient manifestation of the Deity, without real or permanent existence; the human soul is an emanation of the Divine Spirit in a perishable body, and in a state of misery; every effort of man should be directed during life to the liberation of his soul after death, and its lasting union with the Divine Being. This high and lofty theory reduced to practice became tainted with the most degraded superstitions. The original Nature-worship degenerated into orgies of the vilest character; the institution of caste imprisoned the minds of its votaries within a narrow circle of routine from which there was no escape, and the whole system sank into a hopeless condition of imbecility and narrow prejudice.\*

This must have taken place at a very early period, since about a thousand years before Christ a reaction took place under a remarkable man named Gautama, or Sâkyâ-Muni, afterwards called Buddha, the sage. His doctrines were not essentially dissimilar from those of the early Brahminical writings, but he endeavoured to restore them to their purity, and inculcated the practice of virtue and self-denial with all the severity of the Stoics. He utterly rejected the institution of caste, teaching the essential brotherhood of all men. Pantheism is the essential principle of Buddhism. God is in every thing, and every thing is God. The human soul, after passing for a time in the vain show of this world, will eventually be united with the Divine essence in the happy

\* "There are in Hindu books passages of unsurpassed beauty, and even purity, and which one might almost think expressive of the loftiest theistic worship. Yet these passages can influence but little those who read them, when they exist alongside of others as vile as these are noble. Nay, more, they positively hinder the spread of pure religion."—Robson, *Hinduism, &c.*, p. 215.

state of imperturbable serenity and apathy called Nirvána. The success of these reformed doctrines was amazing. They spread over the far east with remarkable rapidity, and though by a counter reaction the Buddhists were almost exterminated in India proper about the seventh century of our era Buddhism is still the prevailing religion in Ceylon, Thibet, Burnah, a large part of Tartary, and over the vast region of China; and boasts of by far the largest number of votaries of any religion in the world.

These two creeds are so closely united that it was necessary to take them together. What shall we say as to their future? First, as to Brahmanism, which is the prevalent religion in British India, and its dependencies. Has the attempt to Christianise India met with any success; or, as we are so often assured, has it been a complete and ignominious failure? I have endeavoured to investigate the subject, and have arrived at the following conclusions. During many years the introduction of Christianity into India met with the utmost opposition and discouragement on the part of the Indian Government, and it is only of late years that a fair field has been opened for voluntary effort. Another serious evil to contend with has been the opposition of a large part of the European population, especially the mercantile class, both in their avowed hostility, and in their treatment of the natives, which has brought discredit and aversion on the name of Christianity.

Under all these disadvantages, the success and progress will probably be a surprise to many. A census of religious belief was first taken in British India in 1851, when the number of native Protestant Christians was 91,092. In 1871, when another census was taken, they numbered 224,258, being an increase in twenty years of 140 per cent., or doubling themselves every fifteen years. At this rate of progress it would only take two centuries to Christianise the

whole of India, being less time than it occupied to make it Buddhist, and a far more rapid rate than that by which the Roman Empire was converted to Christianity.

There are many very hopeful signs in British India. The progress of education is loosening the bonds of the old puerile and debased superstitions. The attempts by the educated classes to substitute a philosophical Deism have met with little success. There is a soul's hunger in the native mind which philosophical theories cannot satisfy.

The following remarks by a recent writer of many years' experience in India\* are worthy of notice. "There are traditions in the land which perhaps none has yet attended to with due concern, that the east will be completely changed by a nation from the west; and the tenth avatar of Vishnu, a man on a white horse, so current among the prophecies of the sacred Brahmanical writings, must be looked on to typify the advent of the English in India."

"There can be no doubt that Christianity will assume in India—must indeed assume, if it is to be universally triumphant—an Indian form. If the religion of Christ is a world's religion, it must be capable of assuming the form best suited for each nation of the world. It is absurd to suppose that a race which has shown so strong an individuality, especially so strong a religious individuality as the Hindus, can, in adopting Christianity, follow closely the European models. To suppose so would be tacitly to allow that Christianity was a European, not a Cosmopolitan religion."

"In nothing is the distinctive character of Indian Christianity making itself more felt than in its utter impatience of all sectarianism and sectarian formulæ. To Hindu Christians they are an abomination, a source of weakness and reproach. Both in Calcutta and Bombay, setting aside the

\* *Hinduism, and its relations to Christianity*, by the Rev. John Robson, M.A.

distinctive articles of the churches, they are banding themselves together, and establishing undenominational missions among their heathen fellow-countrymen."

These are hopeful signs, and cannot be overlooked in making any estimate of the future.

The great inert mass of the Buddhist nations, comprising probably from a third to a fourth of the entire population of the globe, seems at first sight utterly hopeless. The untold myriads of the Chinese nation steeped in prejudice and contempt of the outer world, the hordes of Tartars degraded to the lowest stage of superstition, would appear utterly impervious to any outward impression. Yet even here there are signs of movement; the dry bones are beginning to stir. The Japanese, a Buddhist people, are throwing off in disgust their old rags of idolatry, and preparing to clothe themselves in some form of western belief. China is abandoning one class of prejudices in regard to European improvements; and her annually increasing emigration must necessarily lead to the imbibing of new aspects and modes of thought. It must also be remembered that Buddhism pervaded the dense masses of China with almost unexampled rapidity, thoroughly overturning the old, and introducing a new national religion. Human nature remains the same in every age. It is as true now as thousands of years ago, that a little leaven with vital energetic power soon leavens the whole lump.

Mahometanism, as a Semitic outgrowth kindred to Christianity, stands in a closer relation to us than the eastern religions just referred to. Its three great principles of the unity of the Divine Being, the essential equality of all mankind, and the inculcation of temperance, combined with the unscrupulous use of force in its propagation, imparted to

Mahometanism a living power, which carried it in triumph, in the course of a few years, from the deserts of Arabia east and west, to the Himalayan Mountains on the one hand, and the Pillars of Hercules on the other. Its vitality appears to be exhausted, and fallen into a decrepit senility. It cannot stand the bright light of modern progress. Weighted with the degrading institutions of polygamy and slavery, inimical to education, and incapable of assimilating modern ideas, its representative in Europe is supported by the jealousy of the Christian powers in a condition of tottering decadence which cannot long delay its fall. The fair regions of the east, for ages reduced to torpor and desolation by its baleful influence, may then again smile with the light of life.

The present condition of the heathen world conveys to my mind the conviction that, like the handwriting on the wall of Belshazzar's palace, there is written on the face of all these institutions, "The kingdom is taken from thee, and given to those that are worthier than thou." Who are they that are to succeed to the inheritance?

We stand, then, confronted with these facts. Human nature must have a religion. The spiritual appetite craves for food; and, unsupplied with celestial manna, it has striven to supply its cravings with the husks of its own selection, until they have become utterly intolerable and loathsome. Under these circumstances, it appears to me that the only religion possible for the future is Christianity. Whether we believe its doctrines or not, Christianity is a fact. It is a fact that under its auspices and under the influence of its institutions all that there is in the world of enlightenment and progress has grown up. The atmosphere with which it has surrounded itself is redolent of life and vigour. Whilst every other part of the world has sunk into

torpor and decay, Christendom has displayed a vitality and energy which have unlocked the secrets of nature, which have measured and weighed the heavenly bodies, have sounded the depths of space, and brought back messages from far distant worlds. Where but in Christendom do we find developed that gentle spirit of humanity which has struck the fetters from the slave, has raised woman from a state of degradation to one of honour, dignity, and affection? Where also do we find sympathy with every form of human suffering, and provision for every mortal calamity? In the light of Christianity human life, with all its chequered scenes of joy and sorrow, assumes a new aspect and new relations. Strengthened by its convictions and animated by its hopes, the martyr has welcomed the stake, and the patriot cheered on to victory in the hour of dissolution.

Christianity in regard to civilisation has a three-fold bearing.

1st. It furnishes to man a motive power outside himself, derived from a personal being, in devotion to whom the heart can satisfy its widest cravings for sympathy and love.

2nd. It sets forth a standard of morality, so simple that the most ignorant can understand it, and yet so lofty that the holiest and wisest will always find it above and beyond them.

3rd. It is adapted to all climes, places, circumstances, and conditions; the highest state of cultivation, and the lowest conditions in which humanity is found. The burning deserts of Africa, and the snowy plains of Iceland; the dwellers in the crowded city and on the solitary moor are equally capable of imbibing its tenets, practising its precepts, and receiving its consolations. No doubt it may be said that in practice the result is far behind the ideal which is presented, but there is this essential difference between Christianity and every other religion the world has seen,

that the defects of its followers are owing not to the religion, but to the want of it, whilst in all the others the evils arise from the religion itself.

I apply these remarks not to this or that special form which Christianity may have assumed, but to its influence as a whole. Catholic and Protestant, Unitarian and Trinitarian, Episcopalian and Baptist, whatever their dogmatical differences may be, all acknowledge the divine motive power, the high moral standard, and the all-embracing adaptation of Christianity. So far as I am aware, there is no difference in the estimate of practical goodness in any of the sects into which Christendom is divided.

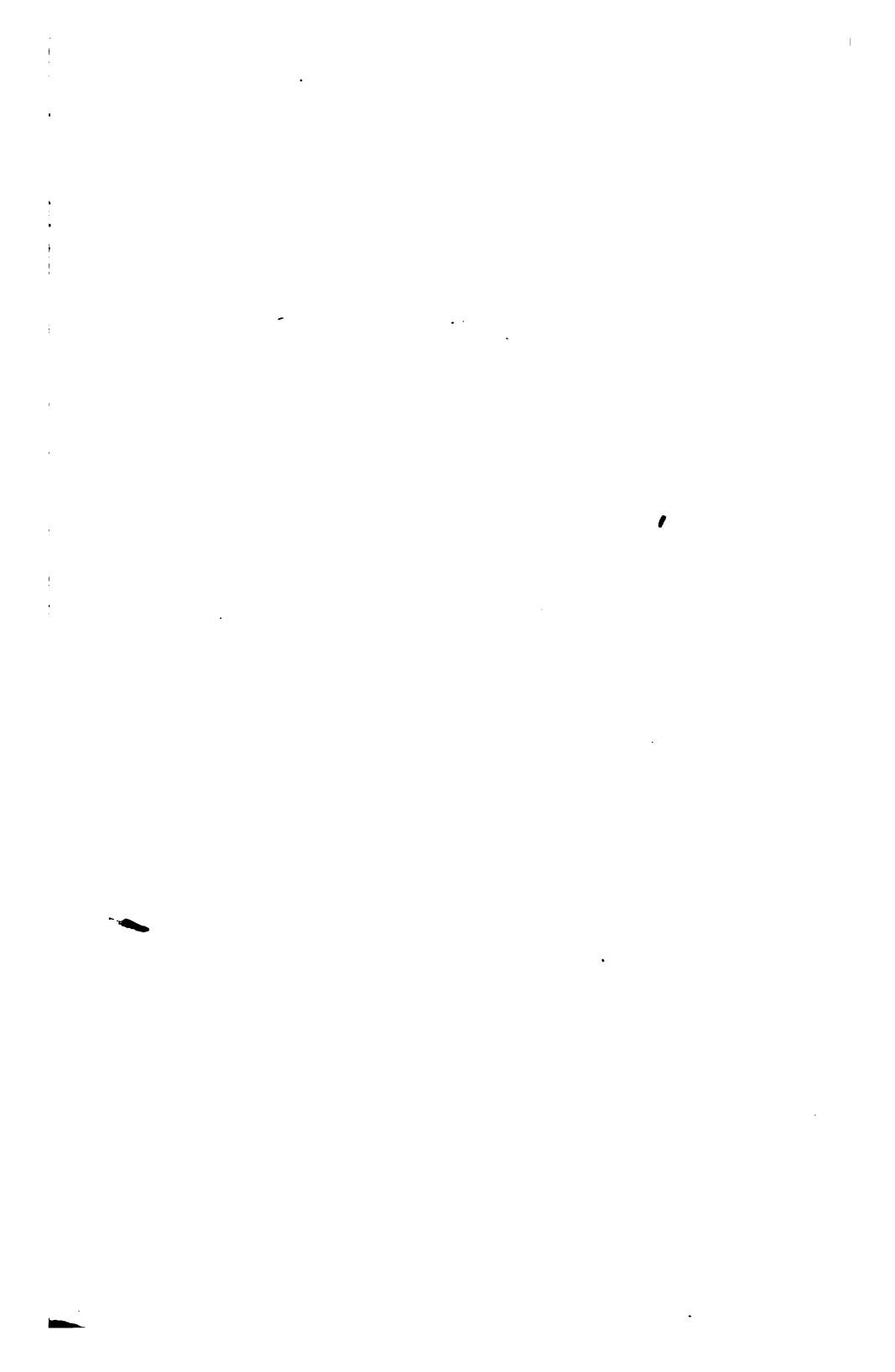
If these elements then be essential to the future progress of civilisation, or in other words to the perfection of humanity, and Christianity alone can supply them, it then follows as matter of necessity that Christianity is the only religion practicable for the future.

I have thus endeavoured, feebly and tentatively, to throw together a few thoughts of a speculative nature on the tendencies and future of modern civilisation. What will the end be? How far will man's perfectibility on earth be carried?

The world we live in is fair and beautiful, and capable of ministering to man's happiness in a far higher degree than has ever yet attained. Sin and sorrow, disease and death, will never be entirely eliminated, but they may be greatly diminished in intensity and pain. The golden age contemplated by the poets has always receded either to the far distant past, or to the equally distant future; but if it is ever to be found at all, it will be in the living present. The Divine Teacher, with that truth to human nature which is visible in all his words, to his disciples' enquiry, when that golden age, the Kingdom of God, should appear, replied "The kingdom of God cometh not with observation, neither

shall they say, Lo here, or Lo there! for behold the kingdom of God is within you." Yes, we may all make our own golden age by doing our duty, by suffering if need be, by the diligent employment of the talent committed to our charge, by serving our generation, and thus helping to prepare the way for

That far off divine event,  
To which the whole creation moves.



## THE TRUE MACBETH.

By EDWARD R. RUSSELL.

It is said, ladies and gentlemen, that the drama, especially the acted drama, and pre-eminently the Shakspearian drama, is recovering its position in the estimation of cultured persons. I am not careful to consider whether this is so or not. If it is, so much the better for cultured persons; if it is not, so much the worse for them. In either case the drama, at least so far as its published repertory is concerned, is independent of their patronage. It will never owe much to the condescension of the supercilious, and we may hope there will always be a histrionic remnant to preserve its traditions, and to make new ones. As a student both of plays and the stage, I am glad that "Macbeth" is prominent in the public mind of 1875, as "Hamlet" was in 1874; but under any circumstances an enquiry into the true reading of the play would have been an undertaking worthy of this Society.

By the true Macbeth I do not mean the historical Macbeth. Of his reign, George Buchanan says, "Some of our writers do here record many fables which are like Milesian tales, and fitter for the stage than for history, and therefore I omit them." Before many years had elapsed, these mythical stories, so far as they met the taste and suited the purpose of the dramatist, had passed into the atmosphere for which Buchanan thought them most suitable. And from that time forward the only Macbeth was Shak-

speare's. Of his prototype we know from the chronicler Holinshed that he was a most valiant gentleman, and one that, if he had not been somewhat cruel of nature, might have been thought most worthy the government of a realm. Like other sanguinary despots—besides exhorting young men to exercise themselves in virtuous manners, and men of the church to attend to divine service according to their vocations—he made himself thought by the commonalty a just king. He appears to have beheaded only the tall poppies, and was even described as the sure buckler and defence of innocent people. But as respects his conduct towards the thanes, the history bears as black a record as the play. At length, the chronicler tells us, he found such sweetness by putting his nobles to death, that his earnest thirst after blood in this behalf might in no wise be satisfied. Here we perceive a sort of pleasure in blood-guiltiness which the play has not in the slightest degree imitated. In the chronicle, moreover, there is only a mere mention of Lady Macbeth's ambition and instigation, the simplicity of which allusion is most remarkable. As at once fixing the two principal original contributions of Shakspeare to the subject, it deeply impresses me with the view of the play's main meaning, which I shall presently endeavour to state. Instead of his wife, Macbeth, in Holinshed, has for his coadjutor in regicide Banquo, whom Shakspeare, on the contrary, has made an altogether honourable and estimable man in the midst of villanies which he entirely understood and might have been privy and party to. Banquo is murdered, in the history, however, all the same, "for the pricke of conscience (as it chanceth ever in tyrants, and such as atteine to anie estate by unrighteous means) caused Macbeth ever to feare, least he should be served of the same cup as he had ministered to his predecessor." In the inception of his ambition, the Macbeth of the chronicle is inspired and

befooled by the witches—"resembling creatures of elder world"—and, after recording their first meeting, almost precisely as in Shakspeare, Holinshed goes on to say that the incident was reputed at the first to be a vain fantastical illusion, got up by the two generals; but afterwards the common opinion was that these women were either the weird sisters, that is to say, the goddesses of destiny or fates, or else some nymphs or fairies endued with knowledge of prophecy by their necromantical science, because everything came to pass that they had spoken. As to this, we are of course entitled to suppose, as we list, either that such doubts did prevail in Macbeth's time, or that in Holinshed's time they were believed so to have existed. As in other Macbeth questions, the interest of the witch element has come to centre entirely in Shakspeare's use of it, which, it is part of my purpose to show, has been considerably misconstrued. The murder of Duncan in his sleep, and the confused condition of the grooms when they awake, may have been suggested by a passage in the chronicle relating to another incident, namely, the massacre of King Sueno's Danes in their camp by Macbeth, under the orders of Duncan, after the Scots had treacherously drugged their ale and bread. In closer correspondence with the play we have the fact that Macbeth, as king, had in every thane's house "a sly fellow in fee." There is also—and so nearly identical that Shakspeare may be said to have merely turned it into verse—the curious conversation between Malcolm and Macduff, when the latter seeks the former in exile: an episode which lies apart from the necessary action of the play, and which was evidently adopted by the poet, because he was struck, as he well might be, by its originality. Lastly, we have the juggling charm of Birnam Wood and Dunsinane, the assurance by a certain witch in whom he had great trust, that Macbeth should not succumb to one of woman born, and the catastrophe, turning

as strictly as in the play, on the non-fulfilment of these "words of promise."

So much for the true Macbeth of the chronicler. For us it is only important to notice that almost every purely dramatic point was supplied or suggested to Shakspeare, and that his most substantial additions were subjective. He was too thorough a playwright not to improve to the utmost on the incidents and situations with which he was provided; but, intellectually, the most important of his contributions were in the domain of character and ethics. Even the magnificent conception of the sleep-walking scene, though it has given to the stage one of its finest and most celebrated episodes, is psychological, so far as it is not simply awing and pathetic.

If we avoid discussing the true individuality, and the reality of the Macbeth of historical tradition, not less shall we keep clear of the question, Whether the play, as we have it, is the true Macbeth of Shakspeare? Those who wish to see this called in question under the newest lights may read the terse and interesting preface to the play in the Clarendon series, by Messrs. Clark and Wright, of Trinity College, Cambridge. Without decrying such studies, or underrating the qualifications of these gentlemen for pursuing them, I must say that the results rarely impress me as true or acceptable. It is with them as with much modern criticism on internal indications of authorship and authenticity in the gospels, and especially the fourth. A number of vastly wise and very positive conclusions have been arrived at, which any sciolist might fix for ever in his sterile mind by a couple of days' study. When obviously true they are conspicuously worthless; when not palpably certain they may be safely rejected. They are small and technical, dull and dry, unfruitful in great inferences, devoid of spiritual insight.

They irritate a little, like moribund flies, but they do not render religious life or literature utterly unbearable, and now and then comes genius—as in the recent criticism of Matthew Arnold—and thoroughly fans them into space. Messrs. Clark and Wright are amongst the most reverent critics on the internal evidence of Shakspeare, but, to take an example, they mention, as singularly weak, and as an unskillful repeating of other passages, the weary soliloquy in the fifth scene of the fifth act of “Macbeth”:

If this which he avouches does appear,  
There is nor flying hence nor tarrying here.  
I 'gin to be aweary of the sun,  
And wish the estate o' the world were now undone.

These lines are surely full of truth and pathos. They are rhymed according to a mannerism of the period, and when Shakespeare introduced such couplets, it frequently rendered some of his verses unequal in expression. If he had been writing prose or not in rhyme, he would not have composed the last line of the four we have just read. Still the idea even of that line is a good one, and if it were bad we could endure fifty such for the sake of that which precedes it. The words “I 'gin to be aweary of the sun” are so spoken by great actors that the auditor in the theatre almost feels beating upon his own head, and glazing his own eyes, the dry, fretting heat of the sun, which, if you have noticed, is most grievous in times of mental depression. Even without this special effect—which, by the by, compares curiously with Malcolm's

Let us seek out some desolate *shade*, and there  
Weep our sad bosoms empty—

the idea of weariness of life is, with any reading of the lines, most affectingly conveyed. The value of dogmatic internal criticism might be staked on this instance; and even if a

manuscript of the lines signed Thomas Middleton were discovered, we might fairly suspect a forgery.\*

Without standing out for the genuineness of every line in the play, I confess that I find it all good enough for me; and some of the arguments by which excisions are advocated are extremely shallow and apparently uninformed by a wide observation of Shakspeare's manner. If there is anything utterly below par—as Coleridge deemed the episode of the porter—it is quite as likely that Shakspeare, in his capacity of theatrical manager, tried to catch the groundlings as that any one else did it in his name; and you probably could not cut a line out of even the most inferior passages with any certainty that you would not hereafter regret it.†

Two textual suggestions are made, however, which bear upon the true meaning of the tragedy. One is for the exclusion from the text of the bleeding sergeant. Here we are told of slovenly metre, of language more bombastic than Shakspeare's even when most bombastic, of inconsistencies with the next scene, and of the absurdity of news of a victory being sent by a wounded soldier. It may be the fault of long and loving familiarity, but these hypercriticisms fall flat and flaccid on the Shakspearian sensorium. Turn to the scene. It is certainly set in a strident key, but that key is appropriate to the situation and character of an excited soldier, just returned from a terrific engagement in which his idolised general has achieved prodigies of personal valour and slaughter. Nor is the bombast excessive. It is

\* No doubt there is a difficulty in reconciling lines 52 and 53, of Scene II., with lines 72, 73, 112, *et seq.*, of Scene III., but it is not stated that the thane of Cawdor was killed, and by a stretch of courtesy or argument Macbeth might call him prosperous. At worst, the difficulty is not so important as the loss of the scene would be serious.

+ Shakspeare's taste was far from faultless, or he often allowed it to lapse into quiescence. One of his worst lines—one of the worst lines in any poet—

" His silver skin laced with his golden blood," occurs in the splendid scene after the murder of Duncan, and has never been questioned, though Dr. Johnson expressed a just contempt for it.

one of Shakspeare's especial marks that though he never forgets the distinctive characters of his personages, he freely endows them with his own imagination. This bleeding sergeant revels in images of wild warfare, intermingled with pregnant phrases that have become household words. It is in this scene that we have the description of a nearly balanced battle :

Doubtful it stood

As two spent swimmers, that do cling together  
And choke their art.

Here, too, is a bold apposition between Macdonwald, with fortune smiling on him, like a rebel's wanton, and Macbeth "*distraining fortune*," like *valour's* darling, carving out his passage with his brandished steel. Here, also, is the scornful reply to King Duncan's question, as to the onslaught of the Norwegian reinforcements :

Dismayed not this

Our captains, Macbeth and Banquo ?

"Yes," says the excited sergeant, taking no thought of the majesty of his interrogator :

Yes;

As sparrows, eagles, or the hare, the lion.  
If I say sooth, I must report they were  
As cannons overcharged with double cracks; so they  
Doubly redoubled strokes upon the foe :  
Except they meant to bathe in reeking wounds,  
Or memorise another Golgotha,  
I cannot tell—  
But I am faint, my gashes cry for help.

To appreciate this passage you must imagine it vividly acted. You must conceive this wounded soldier's elocution becoming more feverish as his strength fails him. If you realise this conception, I am afraid you will not have much patience with the cool and collected critic in cap and gown who

remarks that it was really a very thoughtless thing for Macbeth to send a wounded man a long distance with an important message.

What is most necessary, however, to observe, is what an essential function this scene performs. It happens that in the representation of "Macbeth" which is now the talk of the literary and dramatic world, the bleeding sergeant is omitted. What has ensued? It has been said that Mr. Irving cut out the description of Macbeth's prowess because it conflicted with his craven view of the part, or because it would not do to create an image of Macbeth which his physique would not enable him to maintain. The first suggestion libels the judgment of one of the clearest judges of dramatic character. The second calumniates the good faith of one of the most honest actors that ever trod the boards. Neither is probable. Most likely the bleeding sergeant was deleted because it was desirable to shorten the play; because there seemed to be enough about Macbeth's valour without this scene; and because the two Cambridge gentlemen had pronounced against its genuineness. But how strongly the result justifies the judgment of whoever inserted the episode! The dramatist did not foresee the long line of stalwart and melodramatic Macbeths, who, so far from seeming incapable of military prowess, seemed *chiefly* capable of it, and rather likely to be incapable of qualms and fears and spectral susceptibility. If he had, it would probably have disturbed him almost as much as the sight of Banquo's heirs disturbed Macbeth. What Shakspeare did apprehend was that audiences might not be able to imagine that a man seen so constantly under the influence of ghastly dread could ever have made his way as a general to the position from which Macbeth stepped through blood to the crown. Accordingly he literally overlays the first scenes with accumulated references to Macbeth's bold and successful martial

character in order that doubt may never again arise in any spectator's mind throughout the play.\* For my part, those who think that a brave warrior could never contrive base murders, or succumb to the horrid hauntings consequent upon them, must settle their quarrel with Shakspeare. Where Mr. Irving is wrong, is in not availing himself of the means Shakspeare has supplied of fixing indelibly on the minds of his audiences that bold soldierly professional bravery,† which, though not, as many think, the basis, was the superficies of Macbeth's character.

There is one peculiarity of the mistakes of great actors which gives them a great advantage over the errors of shallow textual critics. They do not impoverish the drama. On the contrary, they people it with respectable and often grand multiplications of character. The Kembles, and some of their predecessors, are responsible for the setting up of a fictitious notion of Macbeth as a magnificent hero, and of Lady Macbeth as a splendid woman, superior to every access of softness. This conception was deeply founded by Mrs. Pritchard, who played with Garrick, and Mrs. Siddons only carried the conception to a still higher point of feminine magnificence. But all the time the true character stared

\* The "Ballona's bridegroom" theory, as I believe it is now called in London, has been challenged before the present debate. It was disputed by Steevens and by a Mr. Whateley, and these critics were spiritedly replied to by John Philip Kemble; but having glanced at these polemics, my impression is that there was a singular inability on both sides to understand the difference between the sort of moral courage required for a life of murder, and the sort that suffices for one of military glory. And, besides, those of the one party as well as those of the other made use of the most fanciful and fribbling arguments.

† "Your husband is extremely brave on the field of battle; but out of sight of the enemy, he is weaker than a woman."—*Napoleon to his sister Caroline, wife of Murat*. Steevens, the commentator, has been much praised for saying and illustrating from "Hamlet," "Othello," &c., that "it is a favourite moral of Shakspeare that crime and a bad conscience make cowards of the bravest." There is much in Shakspeare to support this as a general view. But so far as Macbeth deserves to be called cowardly, he would have been what he was even without crime, wherever and however the choice of good and evil was movingly presented to him.

every reader in the face as he pored over the Shakspearian text, even if it did not lurk in some of the earlier traditions of the theatre. When poor Partridge, in "Tom Jones," saw "Hamlet," he said that if that little man on the stage was not frightened of the ghost, he had never seen any man frightened in his life, and he was quite indignant when it was thought he could prefer Garrick, who looked so scared, to the gentleman who played the king, and who anybody could see was an actor, he spoke all his words so distinctly and twice as loud as Hamlet. From this it would appear that for fine actors to be accused of ignoble physique and elocution is no novelty, and that if the Kembles followed in the wake of similar predecessors, there were at least brilliant exceptions who depended more upon intellect and nature. Garrick, we know, not only played Hamlet as just described, but enacted Macbeth so as to show that, when once excited, he could not conceal the emotions of his soul, even in the presence of Duncan.

Whether the magnificent or Kemble view is right or wrong — whether any acting interpretation which gains acceptance is right or wrong — matters comparatively little. These readings do but multiply the springs of dramatic enjoyment, and when, after exercising the public mind in a certain ideal direction for a certain period, they are corrected by truer conceptions, they leave beautiful traditions to garnish the imagination, and also continue for some time on the stage to afford alternatives for the taste and worthy subjects for critical discussion. To each of the great actors, or great critics who establish dramatic conceptions, we may say, as Sainte-Beuve said to certain authors, "We admire you individually, one by one, though we are not of your sect." Criticism should, indeed, be as catholic as religion, and the less we are able to subscribe to each other's dogmas, the more eager should we be to step out of ourselves into sympathy

with the particular aspects of the beautiful by which each preference is inspired. Far otherwise must we regard the confident mutilations of presumptuous textualists. They rarely purge the work they prune; and they banish into an obscure exile of doubt and discredit many passages that should not lightly be lost.

With one of the suggested excisions, however, I could find it in my heart to agree, if it were only a question of our personal enjoyment in the nineteenth century. The speeches of Hecate appear grossly unworthy of the poet, and, because she is really a supernatural being, they prevent, what would be very acceptable, a rationalising interpretation of the seemingly supernatural in the play. Are not the speeches of the witches equally unworthy? And do they not equally require the *bonâ fide* acceptance of the supernatural? Assuredly not. Gervinus is greatly mistaken in assuming the universal unreality of Shakspeare's spirit-world, and in supposing that none of his apparitions are visible except to persons of over excitable imagination. There is this great difference, for instance, between the supernatural in "Hamlet" and the supernatural in "Macbeth." In the former, the ghost cannot be an illusion of Hamlet, for it has been seen by Horatio and the officers of the guard. But in "Macbeth," no person of the drama, not even Macbeth himself, sees anything that might not have been contrived in the border world which in the days of witchcraft was inhabited by those who dabbled in destiny and traded upon the popular appetite for the marvellous and malign. That Macbeth, in his self-absorbed, illogical way, believed in the preternatural character of what he saw and heard is clear, and therefore the moral interest of the picture of a man acting under such instigations is safe, and cannot be disturbed; but if Hecate were out of the play, and Banquo's ghost allowed to be, as it well might, a spectral illusion, the incredible would be got rid of, while the poetic

standard of the play would be raised. The Rabelaisian recital of the ingredients of the witches' broth, their wild manner of life, and their own evident faith in their sorcery would remain, but such *quasi* sincerities may be paralleled in the history of all impostures. Psychology has never precisely drawn the line where even in the same person honest superstition ends and politic contrivance begins; and it is difficult to believe that, in a practically Manichæan age, the dreaded representatives of the powers of evil would not use their influence deliberately and by concert for any object they might choose to promote.

The strongest argument against a rationalising view, apart from Hecate, is the correspondence between the cutting down of branches in Birnam Wood to mask the approach of the troops, and the strange manner of Macduff's birth, with the juggling prophecy by which Macbeth was braced for his last struggle with fate. But we all know that if we rationalise at all, we must allow a great deal for coincidences; and these coincidences are not more striking than many which are recorded in connexion with the old oracles.

All such speculations are idle, however, unless Hecate's principal speech is spurious, for she appears amongst the witches undoubtedly in a supernatural character. Yet even here it would be rash to cut out any of the text. Shakspeare used to purchase the privilege of delighting himself and a higher class of his hearers by very ample condescensions to the million. Even when condescending, he could not help being often great, but he did condescend; and in this instance, if he himself deemed it worth while to rationalise, as he very likely did not, he, no doubt, thought that Hecate was but a little further concession to the vulgar than the witches, though the latter are at once credible and weird, while their mistress, as represented in his play, is neither true nor impressive.

What we want in such matters of criticism is efficient common sense. Shakspeare has been excitedly represented in almost every light but the true one. To one writer he is a lawyer, to another a Catholic, to another a Tory, to another a gentleman, to another a land-surveyor—and so on. They all forget that he was a theatrical manager, who made a fortune. Whether this lowers our idea of Shakspeare or not is of little consequence, for there is no getting out of the fact. It need not much degrade our estimate of his work. Although a successful theatrical manager, he was also a playwright, and he was also a poet. He did not commit, for the sake of success, any unpardonable sins, and the sins he did commit leant much to virtue's side in wit and humour and character. For my own part, I could spare Hecate very well, and I like to fancy the play without her. But who knows what others may see in her speeches? If Shakspeare were here, perhaps he would say, "You are quite right, she is an excrescence. But she has been before the public a long time. You can rationalise in spite of her. Be thankful that you have got rid of Davenant's singing witches, and, for auld lang syne, let Hecate—who is really mine, though I am not proud of her—remain."

If we are to make anything of Shakspearian criticism we must understand to the full how frankly and practically Shakspeare did his work. He was not a regularly educated man, but, as Matthew Arnold says, he lived "in a current of ideas in the highest degree animating and nourishing to the creative power," in a "society permeated by fresh thought, intelligent and alive"—a "true basis for the creative power's exercise," in which "it finds its data and its material truly ready for its hand." And he used not only the ideas which he imbibed as they floated around him, but all the learning he could pick up without neglecting his calling. The mere literary man is rarely a profound scholar, but there is no

reason why he should avoid every touch of classics as if Dr. Busby were on the look out to birch him for a false concord, or as if Mr. Robert Lowe were waiting round the corner to cudgel him into his proper domain of common knowledge. There are two sorts of partially educated literary men, and genius has been found in each. A Dickens, partly from honesty and partly from morbid self-consciousness, will avoid, from the first line of his works to the last, any seeming acquaintance with the learning which is rarely got out of the regular University groove. A Disraeli, on the other hand, though he knows better than to attempt to cap Virgil with Mr. Gladstone, can, on occasion, cite a line of Claudian more apt and to the purpose than any of the ordinary stock quotations with which it is an old fashion for double-firsts to recreate themselves.

And so with Shakspeare. To pretend that he had recondite views of this or that race or this or that period to set forth is nonsense. There was no such stuff in his thoughts. There were no such professional subtleties in his programme. But neither did he reject knowledge, or avoid dramatic subjects, which more scholarly men think their own. He undertook anything he thought he could manage, and he was never altogether mistaken. He read as much as he had time for, and, with or without suggestions, imagined "moulds of fancy," as Hazlitt said, which "springs of pure feeling" rose and filled. This was his easy and happy way of going to work; and we must understand it. Because Shakspeare has become a text-book for Universities we are not to suppose that he is by any scholastic standard a classic. He and his contemporaries would have been amazed at such a prospect, though now, if we wanted to redefine the classical, it might be necessary to devise a formula by which Shakspeare would be included. The best of him and of his method is, that there is no straining, no avoidance of certain topics, other-

wise eligible, as lacking in dignity. He reaches heights of majesty, compared with which those of Æschylus himself may almost be called poor and provincial, but it is without effort. He uses no inflated balloons of artificial sublimity. His characters are not demigods. He dares to tell us that his most refined hero was fat and scant of breath. If you are to understand either Hamlet or Macbeth, you must banish from your minds the predominating notion of physical and manly perfection which attaches to the personages of Greek tragedy. It is irrelevant and misleading, however firmly the Kemble and Siddons school may have established it. Shakspere seems positively to have taken pains to exclude it, and to show how differently he estimated the atmosphere in which it is the genius of our nation to produce poetical works of art.

In truth, however, classical elevation was even in classical times a matter of degree. The most classical dramatists have come short of the antique ideal. This was inevitable. There was once a Spanish hidalgo, who, in going along a muddy street, nose in air, had a great fall. As he picked himself up, with all the native grace of a patrician, he haughtily remarked, as if instructively apologising to the awed bystanders, "This comes of walking on the earth." Human dramatists, however Olympian, must walk on the earth. This necessity was always experienced. Mr. Grote tells us that while Æschylus threw around the gods an airy grandeur, even his men did not appear tenants of this common world. It was to the extinct heroic race which had fought at Troy and Thebes that his conceptions aspired, "and he was even chargeable with frequent straining, beyond the limits of practical taste, to realise his picture." But even Æschylus, as Mr. Grote also points out, did not consistently succeed, "because consistency, in such a matter, is unattainable, since, after all, the analogies of common

humanity, the only materials which the most creative imagination has to work on, obtrude themselves involuntarily, and the lineaments of the man are thus seen even under a dress which promises superhuman proportions." If to promise and not perform is as bad in art as in life, we may be thankful that the artificial standard of Æschylus was soon abandoned. Euripides was taunted by Aristophanes as a representative of young Athens, and was accused by pedantic critics of "vulgarising the mythical heroes, and transforming them into mere characters of common life."

Of course, it must be well understood that there were, in the case of Euripides, other modifying circumstances at work than the mere preference for being natural. A transition from the lofty height of Æschylus had already been commenced by Sophocles, who, though adopting a higher standard than that of actual humanity, was always decidedly and exquisitely human; and Euripides appears to have had a special *animus* in pushing the change still further. This is well stated by August Schlegel. "It was by no means his object," says that critic, "to represent the race of heroes as towering in their majestic stature over men of his own age; he rather endeavours to fill up or to build over the chasm that yawned between his contemporaries and that wondrous olden world, and to come upon the gods and heroes in their undress. . . . He introduces his spectators to a sort of familiar acquaintance with them. He draws the supernatural and fabulous," not "only into the circle of humanity . . . but within the limits of the imperfect individuality." Manifestly, ideas were at work here, and changes were being made which fall within the domain of ancient religion rather than that of modern criticism, and of the benefits of which we are only very indirect inheritors. Moreover, it would be in the highest degree unintelligent to repudiate any noble form of dramatic poetry. We may even admit, if we are

contrasting Shakspeare with Æschylus, that our great dramatist is open to a just criticism passed upon Euripides, to the effect that he is very unequal, and that he occasionally sinks from passages of overpowering beauty into downright mediocrity. Still there is an aspect of this old question between moral classicism and moral realism which cannot be dispensed with in this discussion.

It has been pronounced that, "on the whole, the stern monotony of construction brings 'Macbeth' nearer to the Greek type than anything else of Shakspeare's." And the critic who made this observation went on to say that Shakspeare is even more severely simple than his nearest Attic parallel. He compares Lady Macbeth with Clytemnestra, and points out that "the 'Oresteia' is infinitely more complex than 'Macbeth' in its leading motives. Clytemnestra has had great wrong, and her crime does not wholly cut off sympathy. The avenger of her deed is crushed between opposing duties. To strike and not to strike is a sacrilege, and only the council of the gods can at last undo the knot of fate. In 'Macbeth' there are no such doubts. The murder of Duncan is a crime of mere vulgar ambition, without any shadow of excuse or pretence of higher purpose, though the poet might have easily found some. The overthrow of the usurper is as clearly righteous as his power was wrongful. His rule is a tyranny unredeemed by any touch of nobility. The golden opinions he formerly won in loyal service have vanished without leaving a trace. All this," continues the critic, "does not seem quite natural. It may be, however, that the interest is intended to be not natural, but supernatural. Grotesque and absurd as the machinery of the witches now appears to Shakspeare's audiences, if not to Shakspeare himself, witchcraft was a perfectly real thing. The witches probably represented supernatural influence, which is to be thought of as

pervading the whole action. Thus the parallel to Greek tragedy is not a superficial one." The points of this thoughtful, though rather crude critique, will in effect be reviewed before I have done. But at present I use it in order to introduce a sketch-contrast, rather than a comparison between the "Oresteia" and "Macbeth."

The subject of the former is the murder of Agamemnon, on his return from the Trojan war, by his wife, Clytemnestra. The action is thus admirably described by Schlegel, from the point at which the king reaches home. "Agamemnon arrives, borne in a sort of triumphal car, and, seated on another laden with booty, follows Cassandra, his prisoner of war, and concubine also, according to the customary privilege of heroes. Clytemnestra greets him with hypocritical joy and veneration. She orders her slaves to cover the ground with costly embroideries of purple, that it might not be touched by the foot of the conqueror. Agamemnon, with wise moderation, refuses to accept an honour due only to the gods. At last he yields to her solicitations, and enters the palace. The chorus then begins to utter its dark forebodings. Clytemnestra returns to allure, by kindly speeches, Cassandra also to destruction. The latter is silent and unmoved, but the queen is hardly gone when, seized with prophetic furor, she breaks out into the most confused and obscure lamentations, presently unfolding her prophecies more distinctly to the chorus. In spirit she beholds all the enormities which have been perpetrated within that house—the repast of Thyestes, that the sun refused to look upon ; the ghosts of the mangled children appear to her on the battlements of the palace. She also sees the end which is preparing for her lord, and, though shuddering at the reek of death, as if seized with madness, she rushes into the house to meet her own inevitable doom ; while from behind the scenes we hear the groans of the dying Agamemnon.

The palace opens, Clytemnestra stands beside the body of her king and husband ; like an insolent criminal, she not only confesses the deed, but boasts of and justifies it, as a righteous requital for Agamemnon's sacrifice of Iphigenia to his own ambition. *Her jealousy of Cassandra, and criminal connexion with the worthless Ægisthus, who does not appear till after the completion of the murder, and towards the conclusion of the piece, are motives which she hardly touches on, and throws entirely into the back-ground. This was necessary,*" says Schlegel, in all the good faith of classical enthusiasm — "this was necessary to preserve the dignity of the subject, for indeed Clytemnestra could not with propriety have been pourtrayed as a frail seduced woman. She must appear with the features of that heroic age, so rich in bloody catastrophes, in which all passions were violent, and men, both in good and evil, surpassed the ordinary standard of later and more degenerated ages. . . . Moreover, by bringing the sacrifice of Iphigenia thus immediately before us, the poet has succeeded in lessening the indignation which otherwise the foul and painful fate of Agamemnon is calculated to awaken. He cannot be pronounced wholly innocent. A former crime recoils on his own head. Besides, according to the religious idea of the ancients, an old curse hung over his house. Ægisthus, the author of his destruction, is a son of that very Thyestes on whom his father, Atreus, took such an unnatural revenge. And this fateful connexion is vividly brought before our minds by the chorus, and more especially by the prophecies of Cassandra."

The contrast I desire to draw has probably occurred to every listener. Grand as all this may be, how limited is its moral interest — how frustrated by unnatural rules and pompous punctilioes of art — how false and traitorous to reality in order to be classical. Do we not all see that if Eschylus in fetters could make a grand tragedy out of a

mutilated and falsified subject, he would have made a grander if he had been as free as Shakspeare, and his theme as realistic as Shakspeare's story of Macbeth? If Clytemnestra was not too splendid to fall, why should her fall be too mean for tragedy? If she was jealous of Cassandra, why should the poet ignore so powerful a motive? If she loved and sinned for the sake of possessing *Egisthus*, what is there fine in pretending that the strongest, and in her most irresistible, of passions had no sway over her conduct? Why is it magnificent to pretend that she slew her husband because he had sacrificed Iphigenia? What profit is there in such pretences? Above all, is it not frivolous, rather than tragical, to fasten all these horrors on an hereditary curse, instead of making them the moral outcome of ungoverned passions? \*

Again I acknowledge that criticism should be catholic. Again I guard against the supposition that any great production of art, the highest in its own age, is to be rudely challenged or unconditionally condemned. Not in a line would any of us alter the sublime Greek play. But we have a right to resist the encroachments of obsolete classicism when we find it foisting upon us a false "Macbeth."

This has been done, done by high authority and example, done so effectually that to this day the ideal so established governs the taste of most playwrights and the pens of most critics. You may look in vain into Schlegel for any adequate characterisation of "Macbeth." On the sublime side he is loud and lofty enough. He tells us that nothing so grand has been written since the *Eumenides*. He lands the stern rapidity of the action, "as if the drags were taken from the wheels of time, and they rolled along without inter-

\* It is a wonder the whole story of Macbeth has not been sapiently traced by some classicist to the suggestion that Lady Macbeth's first husband and her only brother were slain by Malcolm II., Duncan's Grandfather.

ruption in their descent." His fancy is justly struck by the energy of an heroic age, seen in every feature—"an energetic heroic age in the hardy north which steals every nerve." And he bears witness that nothing can equal this picture in its power to excite terror—"the murder of Duncan, the dagger that hovers before the eyes of Macbeth, the vision of Banquo at the feast, the madness of Lady Macbeth; what can possibly be said that will not rather weaken the impression these naturally leave? Such scenes stand alone, and are only to be found in this poet; otherwise the tragic muse might exchange her mask for the head of Medusa." With all this every reader must agree, nor is it the limit of the great German critic's discernment. He stands up wisely for the realistic vulgarity of the witches, and rebukes a poet of his own nation, who had rewritten their parts to make them sublime. But he loses his cunning when he comes to the ethical aspects of the play. Natural motives, he says, seem inadequate to account for Macbeth's first crime, and he assumes that Shakspeare had some classical or æsthetic object in not representing Macbeth as a hardened villain. The object of the dramatist was, according to Schlegel, a sublimer one. Here I venture to interpolate that no one will ever understand the ethics of Shakspeare (and without understanding his ethics you cannot understand his plays) who is perpetually expecting or supposing him to be sublime. His heroes reach great heights of sublimity, but they cannot be *depended upon* to be sublime any more than they can be depended upon to be logical.\* Shakspeare recognised no such requirement. Those who best understand him will enter into no such contract on his behalf. Human his characters must always

\* A great dramatist, when he has proved his greatness, is not to be too hastily straitened for inconsistency in his characters. We have to stand before them as before undoubted creations. They are men and women almost as much as the man and women whom God has created, and if we are honest and observant, we shall admit that they are not more puzzling.

be; human even when acting under supernatural instigation ; human in every incident and relation ; consistent, *perhaps* ; sublime, sometimes. This greatest of dramatists knew his kind and his craft too well ever to remain long on the stilts. Of this Schlegel was only partially conscious, and unhappily his criticism has settled and given literary sanction to the exclusively sublime theory which the long and absolute reign of the Kembles brought into vogue.

His Macbeth is “an ambitious but noble hero,” yielding to a deep-laid hellish temptation.” All the subsequent crimes to which the usurper is driven by necessity “cannot altogether eradicate the stamp of native heroism.” His wife instigates him to commit the deed which the witches have suggested, “urging him on with a fiery eloquence, which has at command all those sophisms that serve to throw a false splendour over crime.” “Little more than the mere execution of it falls to the share of Macbeth ; he is driven into it in a tumult of fascination.” “Repentance immediately follows, nay, even precedes the deed, and the stings of conscience leave him rest neither night nor day. But he is now fairly entangled in the snares of hell,” and this—not any native characteristic of the man—makes him “cling with growing anxiety to his earthly existence the more miserable it becomes, and pitilessly remove out of the way whatever to his dark and suspicious mind seems to threaten danger.”

I read such an account of the play with a sensation of amazement, confusion, and absence of recognition, which I should think resembles incipient paralysis. I feel as Lady Teazle must have felt when dumbfounded Mr. Surface gave Sir Peter that wonderful explanation of her being caught behind the screen in his library. The play does not support a single line of Schlegel’s imaginative description of its motive. “Not one word, Sir Peter.” The whole of it must be traversed.

• Hazlitt goes further, and calls him “frank, sociable, and generous.”

To begin, Macbeth had conceived the murder before he met the witches. This is proved by the language of his wife when Duncan was in the house:—

What beast was't then  
 That made you break this enterprise to me ?  
 Nor time nor place  
 Did then adhere, and yet you would make both.  
 They have made themselves, and that their fitness now  
 Does unmake you.\*

Lady Macbeth did not quite understand her husband, but she understood him a great deal better than modern critics who take him for a hero. So strong-nerved and determined a woman, who would have scorned to contemplate a villainy she dared not commit, could not be deceived in the signs of cowardice which her husband so plentifully exhibited. She knew him to be brave in the field—as many a moral coward has been before and since. She was even persuaded—wrongly—that if he were once crowned, he would be able to “keep his state” with a sufficient outward show of callous majesty. But she recognised the weak place in him, and saw that she must keep him to the sticking-place. This, rather than primary instigation, was her function, and the necessity of it lay in the inherent baseness of Macbeth, who could neither be an honest man of valour, nor a valorous man of sin.<sup>†</sup>

\* Macbeth not only is proved to have broached the project of destroying Duncan to his wife before going to the campaign, but receives, with a more than natural display of emotion, the prophecies of the witches on the heath, and as soon as one of these predictions has been verified thus soliloquises:—

My thought, whose murder yet is but fantastical,  
 Shakes so my single state of man that function  
 Is smothered in surmise.

<sup>†</sup> Strangely enough Coleridge goes out of his way to explain all this by treating the whole of the mental anxieties of the pair as purely appertaining to conscience. He asserts that Macbeth “mis translates the ominous whispers of conscience into prudential and selfish reasonings, and after the deed done the terrors of remorse into fear from external danger; like delirious men who run away from the phantoms of their own brains, or, raised by terror to rage, stab the real object that is within their reach.” I can only say that this seems to me super-subtle. I can imagine no reason for diving so fallaciously below the plain meaning of Shakespeare’s words, and there are abundant reasons against it.

At first Lady Macbeth took a too favourable view of her lord's weakness. Some husbands show their wives only the best sides of their vices, as others show them the worst sides of their virtues, and it is a proverb, that many a spouse thinks well of her partner long after every one else has given him up. Such facts are quite beneath the notice of critics who cannot descend from the fixed stars of perpetual sublimity; but Shakspeare had a keen eye for them. When Macbeth had already confided to his consort his heroic idea of murdering the king—which, as he then proposed to make the opportunity, was the first and last heroic idea we know him to have had—and when she had thereafter received a letter from him telling the story of the witches, she thus charitably apostrophised him :

Glamis thou art, and Cawdor, and shalt be  
What thou art promised: yet do I fear thy nature;  
It is too full o' the milk of human kindness  
To catch the nearest way: thou wouldest be great;  
Art not without ambition, but without  
The illness should attend it; what thou wouldest highly  
That wouldest thou holily; wouldest not play false  
And yet wouldest wrongly win; thou'dst have, great Glamis,  
That which cries "Thus thou must do if thou have it;"  
And that which thou dost rather fear to do  
Than wishest should be undone.

So far as this is a picture of Macbeth's infirmity of will, it is a true one; so far as it attributes that infirmity of will to generosity of nature, it is unsupported by anything else in the play, and indeed will be found on close examination to break down in the very passage itself. Yet it is often quoted as a proof that Macbeth's was a noble nature until spoiled by the witches and by his wife. I prefer the theory that Lady Macbeth, who loved her husband as strongly as she was determined to make him great, although she knew his weakness, held a too favourable view of its origin, and that what she

took for the milk of human kindness, was really the white feather. The very discrepancy between the man's undoubted and quite comprehensible weakness as presently revealed, and her complimentary way of explaining it, is full of significance most destructive to the amiable and heroic theory of his character.

If Shakspeare had intended Macbeth to be a noble and generous man led astray, nothing could have been easier to him, and the picture would have been a fine one. But that which he has given us, if less imposing, is not less interesting as a moral study. Take the speech at the beginning of the seventh scene. Surely at that moment a hero, and a well-disposed man, with his aged king under his roof-tree, would have felt compunctions other than selfish, and there is a passing reference to the circumstance that Duncan as a guest was there in double trust. But the mean villain is not seriously impressed by this. He is troubled by other matters. The probability that one murder will not suffice frets him. He says, if one murder would serve, he would not mind risking the life to come. But, unfortunately, retribution comes in this life. A cruel man in high place finds his example come home to him to plague the inventor. Besides, king Duncan has been so amiable and exemplary that every one will bewail his loss and execrate his taking-off. On the whole, therefore, the willing murderer does not like the look of things. This noble hero finds his project so likely to make him unpopular, that he really wishes he had something besides ambition to urge him on. If Duncan had only insulted one, now, or even been ungrateful, instead of loading one with honours, how comfortably one could murder him! But it was a bad world for Macbeths in those days, as it is for William Sikeses in this. Nothing went right. The king this "misled but virtuous hero" particularly needed to be rid of was so respectable and kindly that it could not but be a

disgrace to kill him. Such are the sentiments of this speech, and they are again and again exemplified. When Macbeth has had Banquo assassinated, he gives himself the airs of an injured man because the ghost appears at the supper table. "Blood hath been shed ere now," he says querulously, "and when the brains were out the man would die, and there an end; but now they rise again and push us from our stools. This is more strange than such a murder." That ideas of this sort are expressed in glorious poetry does not alter them. They are as base, cowardly, paltry, as they are heartless and devoid of all sense of true repulsion from evil.

Ugly as the business looked, when Duncan had arrived at the castle, Macbeth did not care to drop it, and he well knew his wife would not allow it to be abandoned. Accordingly, he gave her the cue for such stimulating arguments as would best meet the case, by proposing that they should proceed no farther. Duncan had honoured him. He had bought golden opinions from all sorts of people, and these should be worn in their newest gloss, not cast away so soon. A very proper reflection, though not quite in the tone of a good man shrinking from a detestable action. Lady Macbeth answers him — answers him powerfully — answers him unanswerably. But how? Schlegel tells us she uses the sophisms that throw a false splendour over crime. Nothing could be more untrue. She uses no sophisms at all — either here or in other passages. I beg you, for we are now at the heart of the matter, to give your most attentive hearing to the argumentative part of Lady Macbeth's share in this conversation. "Was the hope drunk," she says —

Was the hope drunk  
Wherein you dressed yourself? hath it slept since?  
And wakes it now, to look so green and pale  
At what it did so freely?

An admirable metaphor this: bold, realistic, and to the

purpose; appropriate to the moment and the scene, while the coarse revels of a half-barbaric castle during a royal visit were actually audible, as these two debated the miserable issue on which hung the life which of all others in the world they should have held sacred. "From this time," says Lady Macbeth, knowing her power over her husband, and probably seeing that her apt, rough simile has seized upon his quick imagination—

*Such I account thy love. Art thou afeard  
To be the same in thine own act and valour  
As thou art in desire? Wouldest thou have that  
Which thou esteem'st the ornament of life,  
And live a coward in thine own esteem,  
Letting "I dare not" wait upon "I would,"  
Like the poor cat i' the adage?*

If this plain speech needs a paraphrase, and perhaps it may, for Dr. Johnson said it contained no argument, it should run somewhat as follows:—"Come," says the wife, "no sentiment, no harking back, and no cowardice! Duncan had been just as good to you yesterday. If there were any sound reason of policy why you should give up the idea of murdering him, you would state it. But you do not. You merely lack courage to do what you desire. Surely you are not so poor a creature as to prize the esteem of men without deserving it! Surely it is better that men should hate you in a proud position, resolutely won, than that you should despise yourself in a lower position, in which you remain, not from virtue, but from cowardice. If you were a good man, and had religious scruples — if you were a humane man, as I used to think you, and shrank from cruelty as cruelty — I could understand your objecting. But this mere quaking, without any principle in it, is beneath contempt."

When you durst do it, then you were a man;  
And, to be more than what you were, you would  
Be so much more the man.

Then Lady Macbeth — her mind fixed solely on her one principle, that if you are not prevented from perpetrating evil by scruples it is contemptible to be hindered by mere fear or irresolution — bursts into the celebrated rhapsody in which she describes how remorselessly she would have slaughtered her babe if she had sworn to do it. This produces a very slight effect on her husband. When she asked him whether he was content to live like the poor cat i' the adage, he threw out one of those obvious light outworks of morality which are prompt enough in most of us as extempore defences against temptation — a line and a half which Dr. Johnson said must make Shakspeare immortal if all the rest of his works perished : Who dares do more than becomes a man is none. But this is soon forgotten. While his wife has been talking of dashing her infant's brains out, his mind has lit on the one point that is practical. "If they should fail." And then comes the most significant incident of all. As yet Macbeth has not got the dram he needs. His wife's bold moral theory does not stimulate or assimilate with his mean instincts. He is just as little inclined either to deserve or to lose the world's esteem as ever. He is not screwed to the sticking-place. *What happens?* Lady Macbeth hints at the plan of putting the murder upon the drunken officers of the king's bed chamber. In a moment her husband — this highly moral and noble character, whom only supernatural solicitings and a bad wife can bring within sight of an evil project — is all agog.

Bring forth men-children only;  
For thy undaunted mettle should compose  
Nothing but males.

With wonderful quickness he improves on his wife's dastardly suggestion :—

Will it not be received,

When we have marked with blood those sleepy two  
Of his own chamber, and used their very daggers.  
That they have done't?

LADY MACBETH.

Who dares receive it other,  
As we shall make our griefs and clamour roar  
Upon his death?

These happy thoughts are quite sufficient for the virtuous Macbeth. He is almost as comfortable as a man can be who is bent on a desperate criminal enterprise, with hardly "virtue enough to be faithful to his own villainy." "I am settled," he cries,

and bend up

Each corporal agent to this terrible feat.  
Away and mock the time with fairest show:  
False face must hide what the false heart doth know.

After this, I must say that it seems to me too bad that it should be levelled at any actor as a reproach, that he makes Macbeth craven and abject. What is the man else? What greatness has he except in the field — in vivid eloquence — and in a desperate death at bay? It is no weakness indeed to shrink from crime. To recoil from a misdeed which promises wealth or power is to many a nature a task requiring vast strength of moral principle. No one would call Macbeth a coward for being horrified at the thought of murder. To break into the human temple and steal the life of the building must always be indescribably horrible. There is no image that any of us can conjure up that more thrills our own moral sensations, though we may be barely able to conceive the feelings of a homicide. But Macbeth was meanly wicked, because his mind did not revolt from the deed, but only from its accompaniments and consequences.

At the same time, it must be confessed that in these two scenes, in which the character of Macbeth is fixed, the representation of Mr. Irving — which has been severely censured as too craven — does not exactly bring out the idea of the text. I hesitate to take objection lightly to anything in that wonderful performance, because it is superior, with all its faults, to any other that I have seen, and because I shrink from seeming to be amongst the crowd of empty depreciators by whom the steps of original greatness are always dogged. But in order to distinctly mark the true Macbeth, the new Macbeth must be rigidly as well as sympathetically scrutinised.

Now it seems to me that while Irving has most truly and firmly caught the character of Macbeth, he has not quite so successfully apprehended Shakspeare's method of displaying that character. Shakspeare depends more on light and shade. Irving relies too much on a prevailing dun colour. His first scene is faultless. When the dim rocks of the witch-prelude have vanished, and the heath is revealed, upon which the returning generals meet the imperfect speakers who prophesy their fortunes, Macbeth enters on a rising ground, and the striking profile of the actor is seen clear-cut against the murky sky, as he gazes with the keenness a great general never quite lays aside across the gloomy country. He turns to the audience, and in a single gaze, as in "*Hamlet*," fixes the character of his whole performance. Is this right? It would not be if Macbeth were, according to the received notion, the amiable tool of a wicked woman and an irresistible destiny. But it *is* right, because the dramatist has given the actor the means of knowing before hand the restless, acquisitive moral nature that lives within Macbeth's warlike exterior. As he stands there in clear outline against the lurid sky, no one could fancy him an ordinary successful general on his way home from victory to

honour. There is more in him, and the overplus is high-reaching, gloomy, and mischievous. Such a disposition, insatiably ambitious, fretful over the need to do ill deeds in order to satisfy unbounded desires, but never genuinely turning away from a temptation that promises advantage, is tinder for the sparks of the witches' promptings to fall on. At the first contact the glimmering tracery of evil suggestion fits and flutters through Macbeth's being. Honest Banquo—too little regarded by lovers of the play, one of the finest examples in poetry of unsmirched and unsmirchable honour in a mind quick to comprehend inducements to evil and to note the yieldings of others to brilliant temptation—honest Banquo sees almost every thing that is passing through his colleague's mind. There is very little secret about it. Before he meets the witches Macbeth has thought of murder. From the moment when they call him king he dwells on murder. From the instant when, being greeted Thane of Cawdor by the king's messenger, he has earnest of the fulfilment of their weird prophecy, he *means* murder.

There is really nothing gradual in Macbeth's villainy, except as bloodshedding begets an appetite for more. His wife screws him up to it in the first case of Duncan, but she is only the lever; the screw is in his own mental machinery. By and by, when he groans that Banquo and Fleance live, she faintly returns to her old strenuous prompting way, though she is already sickening at the expanse of blood into which they have waded; but Macbeth has anticipated the suggestion, has even made his arrangements, and the murderers are already on the track of his innocent victims. Yet this prompter Macbeth, though grown stronger in deed, is the same in heart as the wilful murderer who received the witches' "All hail" at the head of his army. And this unity of character it is Mr. Irving's constant purpose to conserve.

But the bow should not always be bent, and the Macbeth

of the scene with his wife in which the project is discussed would better illustrate the uniform worthlessness and selfishness of this murderer on principle if the gloom were lifted a little. The air of abstraction which Irving wears on the heath is maintained in all companies. His Macbeth makes but the faintest and most ineffectual attempts to bear himself like other men, even when he receives the king's thanks, and afterwards when the robes and ceremonies of monarchy might seem to call for more conventionality of manner. There is a meaning in this. The actor probably intends to indicate his perception of what is plainly written in the play, Macbeth's absolute dependence on tyranny, spies, and murder, and his independence, with these weapons in his hands, of all the more delicate resources of policy. The idea is carried a little too far, however, in King Macbeth's public appearances; and so also Irving's unrelieved gloom and abstraction in the important debate with Lady Macbeth undoubtedly weakens the very impression that he desires throughout to produce. Instead of springing, as the text requires, to the suggestion of throwing the murder upon the grooms, Irving's Macbeth seems too incurably weak to get all the practical comfort out of the suggestion that his wife does, though he is also too much himself in his *role* of an ambitious, practical murderer not to appreciate the value of it as a means to an end. There is none of the unscrupulous freshening of his spirits, which one perceives in reading the passage. The power and intention of the actor comes out, not there, but in the succeeding words. Macbeth goes off with his wife, saying, in a half vacant, half desperate manner, that the false face must hide what the false heart doth know. And here, no doubt, in this one line of the exit speech, he takes the right tone. You feel as you look at him that his face will never be false enough to hide his trouble, and that Lady Macbeth will have

the intolerable responsibility of keeping up a curtain of fair show before the horrible realities which will presently and for long years be the basis of their greatness.

With this deeply reflecting actor, it is often in another scene than that in which they occur that the words of any particular passage receive their finest illustration,\* and it is in the dagger and actual murder scene that we perceive the profound meaning which in a man of Macbeth's mould lay in his previous undertaking to "bend up each corporal agent" to his "terrible feat." According to the notions which seem to prevail amongst a majority of critics, any such effort should be unnecessary. If he were going to battle, and were in danger of immediate death, his corporal energies would need no bracing; why should noble Macbeth become physically unstrung at the task of killing a weak old man in his sleep? Shakspeare knew better, and Irving, as was said of him in Hamlet, "will not go out of the character." As he enters alone, and begins to follow the dagger in the air which — significant phrase — marshals him the way that *he was going*, I can compare his gait to nothing but that of a sick man roused from his couch and feebly staggering to his feet amidst the swayings of an earthquake. As at length he creepingly approaches the door of the king's chamber, at the words "Thou sure and firm set earth," his feet, as it were, paw for the ground, as if he were walking with difficulty a step at a time on a reeling deck. When he returns, after

\* Sometimes there is great strength in his abstention from usual effects. For instance, all previous Macbeths have, I think, made a great point by a complete change of manner at the words, when Banquo's ghost vanishes,

Why so,

Being gone! I am a man again.

Mr. Irving, on the other hand, delivers these words in the anxious tone of a man who ought to feel relieved, but in truth does not. This is much truer. It may probably be taken as a rule that sudden absolute changes of manner which leave no trace of the previous tone of feeling are unnatural and melodramatic, except where there is an entire change of the material circumstances; and even then are not always true to life.

committing the murder, we see at once, if we are calm enough, what Irving has added to the achievements of his greatest predecessors in this scene. Hazlitt — whose comments on Macbeth are not altogether worthy of him — said of Edmund Kean, that he left it in doubt whether he was a king committing a murder, or a man committing a murder to be king, but that as a lesson in common humanity his acting was heart-rending. "The hesitation," says Hazlitt, "the bewildered look, the coming to himself when he sees his hands bloody, the manner in which his voice clung to his throat and choked his utterance, his agony and tears, the force of nature overcome by passion, beggared description." This must have sufficiently surprised the Kemble school. Irving has partly added, partly substituted, an idea of tremendous physical prostration, essential to the character of one whose bravery all leaves him when he is wickedly engaged. He reels, he totters, he can barely support himself. One fears that he will smear his wife's arms, or stain his own clothes, with the bloody daggers, as he half holds them in a sort of paralytic clutch, with all intelligent gripe and management gone out of his fingers. His very articulation is as if his teeth were loosened and his tongue swollen. He flounders and all but faints in forlorn wretchedness and horror. His body sways as if already hanging on a gibbet. He is slowly dragged off the stage, moaning, more dead than alive.

To understand this it is not enough to feel the situation. We must know the true Macbeth. We must see, as his wife has seen from the first, that he is capable of suggesting and devising crime, but not of insensibility in committing it.

The true Macbeth is a being whom Kemble could not, whom Schlegel did not, comprehend. The true Macbeth lay out of Kean's simple and single-minded range, and was partly missed even by the more metaphysical but still majes-

tic Macready. There is no reason why in his ceremonial public appearances, and when under the eyes of courtiers and soldiers, the true Macbeth should not have a sort of keen-eyed eagle-like stateliness, except at the points where he is "unmanned in folly." But it is of much more consequence that his demeanour, when his character reveals itself in undress, should vividly present the finely distinguished traits upon which Shakspeare has expended the utmost skill of moral delineation. The true Macbeth is neither a generous hero nor an insensate criminal. He is rather a man who, though not devoid of moral feeling, is without operative conscience — a man who, innocent of cruel tastes or malignant resolve to be a villain, is always, and knows he is always, open to the suggestions and invitations of his besetting passion — a man ever ready to meet such cues to wickedness half-way — and not capable, even when racked by fear and misery, of entertaining the idea that moral considerations are to veto any act he considers for his interest.

Of the immense impulse given to such a character by temptations which appear to approve themselves supernatural there can be no doubt. Nor is it less evident that the palpable intervention of diabolical agency adds great grandeur to the conception and action of the play. If I dwell but little on the more magnificent side of "Macbeth," it is not because I appreciate it less, but because that is a part of the truth which both proclaims itself and is constantly proclaimed. The moral meaning of Macbeth has hitherto been less clearly perceived. For instance, Schlegel, in the passage I have summarised, treats all Macbeth's crimes as following of necessity on the first, and as being deeply associated with the temptings of "that being whose whole activity is guided by a lust of wickedness." But why did Macbeth murder Banquo and attempt to murder Fleance? There was no necessary

connexion between possessing the throne and excluding Banquo's issue permanently from it; and besides, the evil ones whom, when it suited him, he so implicitly believed had told him distinctly that the heirs of Banquo should wear the crown. The attack of Macbeth on Banquo and Fleance is inconsistent with the Schlegel view altogether, but it suggests to us — and Shakspeare undoubtedly meant this — that even the most heartily accepted supernaturalism may not greatly divert the course of human conduct, and that when men seem most under the control of circumstances or of religious belief there is a considerable margin left to the human will.

As yet, though we have dived rather deeply into the moral significance of the true Macbeth, we have not gone far from the lines of the story as Shakspeare received it. Let us now consider for a moment what he did when it occurred to him that Macbeth, King of Scotland, would make a good play. I have already suggested that there was nothing of the pedant or philosopher about Shakspeare. He was not a transcendental poet, nor a university scholar, nor a peer or country gentleman devoted *con amore* to the literary art. He had no "views." He had no special objects in reproducing the past, and affected no idyllic or classic mannerisms. He was not a Leighton or a Poussin of the pen, to revive in faithful grandeur or contagious sportiveness the demigods or the fauns of old. He was a working London playwright, who got hold of the best subjects he could, and made the most of them. But although in his occupation a mere literary caterer for a capital, he had none of the small cynicisms or the narrow limitations of that character. He never dwarfed or demoralised his subjects. He let them expand his pinions, and kindle his disposition to soar. Although a practical London dramatist, he possessed and revelled in what De Quincey called "that constitution of

faculties which our English poets have possessed in the highest degree, and Scottish professors in the lowest: such a constitution of the moral faculties as" gave "him an inner eye and power of intuition for the vision and the mysteries of human nature." I love to imagine, therefore, how Shakspeare, as a literary workman, proceeded upon the undertaking which issued so marvellously.

The supernatural element he found ready in the chronicle, but not in the full legendary strength of unmixed myth. We can imagine how that little cloud, the size of a man's hand, rose and swelled into vast misty forms, until it covered the whole firmament of the poet's inspiration. Then, as it cleared fitfully away to give glimpses of the personages of the drama, the mind of Shakspeare would fasten on this or that possibility of contrasted character, and think it out into fair promise of beauty. Thus would be developed the serene individuality, the "unpossessed mind," as Coleridge beautifully says, of Banquo, in the history an accomplice in treason and regicide, in the play the most gallant and honourable of loyal men. But the most fruitful suggestion — and here we must most honour the genius of Shakspeare — was the brief hint that Macbeth's wife egged him on to the murder. This was an opportunity that might easily have been missed, but out of it grew the true "Macbeth," using the word now as denoting the play.

A great bad deed, the step to a throne, is contrived by two persons, and these two man and wife. Two cannot go together unless they are agreed, and it would have been natural enough to make these partners similar to each other. The play would have been just as magnificent, and quite as classic. But Shakspeare never believed in common forms. It was suggestion enough that one of these criminals was a man and the other a woman. He dared to conceive that the woman, if bad enough to concur in a murder, might be much

more practical in the crisis of it than the man. They were husband and wife, and he knew how their natural co-operation might gloss over the horrible character of their undertaking. He knew also how close the wife would cling to her husband in their common guilt, and how whatever succour could be had from an accomplice spouse whose hands were of his colour would be truly his. This, however, in time would fail. Their horrible copartnery would poison their joys, though it might not untune their concord. Almost their last ardent embrace would be that which they took in the first glow of the anticipations kindled by the witches' prophecies. Thence-forward their union might be affectionate, solicitous, profound; but there would be no possibility of husband-and-wifely happiness when once the secret of blood-guiltiness should begin to weigh around their necks as they hung upon each other's.

Better be with the dead,  
Whom we, to gain our peace, have sent to peace,  
Than on the torture of the mind to lie,  
In restless ecstasy.

We can imagine the dramatist, more rapt over this picture than he had been over the grander foreshadowings of fate and supernatural temptation, tracing with stern yet tender pencil the dreary course of this miserable couple—the architects of their own majesty, the slayers of their own felicity—as together, yet apart, hand-in-hand, and yet with the icy seclusion of individual guilt closing them in from each other, they should drag through the "to-morrow, and to-morrow, and to-morrow," creeping a "petty pace from day to day," the melancholy to-days and yesterdays which "light fools the way to dusty death." How ghastly the sad separate end of the wife, in the inanition of worn-out misery, must have loomed at the end of one dreary vista, a companion tableau to the fury of heroic despair in which the husband

at the dim extremity of the other was, as in the original story, to terminate his life ! How sombre the silent sinking of that gaunt, frail form, with heart unsolaced, nay with heart broken, amidst “ a cry of women within ! ” How crashing the fall of that once more martial figure, upon the shards and fragments of his own piercing cruelties, with heart not even touched, with a mind overclouded in the last moments of life by the old, weary, mean perplexity of doing wrong without suffering for it—how to juggle with the fiend and not get the worst of the game !

Even yet the dramatist’s marvellous sketch-book was not complete. There were still subtleties to be added—subtleties of which acting can make little, and of which criticism, because they are religious, makes nothing. To me there is nothing more interesting than the distinct line which Shakespeare has drawn between the two bad natures, which he might easily have kept as much alike as they were closely united and co-operative. If his gifts had been those of Robert Browning, and his calling that of an evangelical confessor, he could not have more finely discriminated between two faintly separated types of sinfulness. And yet how simply it is done—with none of our later poet’s morbid pother, and none of the spiritual director’s didactic unction ! A touch here and there suffices : but what touches they are ! It is not merely that one nature is strong and the other weak ; nor is it that the one more naturally than the other recoils from wickedness. The distinction is that by the woman in her guilt religion is altogether put aside by an act of will, while the man allows its more terrible images and its less lofty considerations to trouble him, although he has irreversibly resolved to do wrong. The woman says—as women will, when they are thoroughly bad—“ We are not good, and we know it. We are for this world ; for the things of sense ; for the life that passes in palaces and ends in royal

obsequies, with an assured succession full in view. Why dwell on thoughts of God and right and hereafter? If we wanted to be pious we should not be murderers. As we are murderers, we should be foolish to occupy ourselves with thoughts that can only be good for good people." The man cannot follow her here. He tries, but fails. Conscience in its proper sense he has none. Probably she has more than he. At any rate, something that passes for her conscience kills her as surely, though as mysteriously, as an uncomprehended cancer. His conscience does not kill him, and would not in a century. It consists only of a sordid dread of consequences. But the religious element is strong in him notwithstanding. It helps to make him an easy disciple of the witches. It binds him to the hopes their incantations yield him, though his bad instincts are too strong for even supernatural forecasts to warn him off any part of the evil path. In the midst of all his evil deeds, religious terrors rise and scare him. He talks of the life to come. He is horrified that he cannot say "Amen" when the grooms who sleep by the side of their murdered master cry "God bless us!" Such an idea would never have been allowed room in Lady Macbeth's mind. She says, "Consider it not so deeply." He weakly asks why "Amen" should stick in his throat when he has most need of blessing. She is prompt with her one recipe for comfort. Neither he nor she has any insidious materialism to fall back upon. She does not pretend there is no hereafter. She scorns sophisms, though Schlegel says they are her usual resort. She knows only one way of doing wrong and being moderately comfortable. You must banish reflection:

These deeds must not be thought  
After these ways; so it will make us mad.

Her husband has heard a voice that cried, "Sleep no

more. Glamis hath murdered sleep, and therefore Cawdor shall sleep no more ; Macbeth shall sleep no more." These names must have struck her imagination, but her will is stronger. She asks, in a matter of fact way, " Who was it that thus cried ? " She knows well enough that Macbeth's feeling is justified if everything is to be taken into account, but she limits her view to the mundane practical. " Worthy thane," says she, and the expression seems to be chosen from a dry and unconjugal vocabulary for the occasion —

You do unbend your noble strength, to think  
So brain-sickly of things. Go, get some water  
And wash this filthy witness from your hand.

And so on, through the scene. Her constancy never leaves her unattended, because it is against her principle to be troubled by supernatural matters ; because, having made up her mind to do wrong, she would think it childish to expect the comfort of doing right.

There is a fine suggestion of this in Miss Bateman's reading of the letter on Lady Macbeth's first entrance. Most Lady Macbeths have read with unbounded exultation the sentences in which are recited the prophecies of the witches ; Miss Bateman reads them with interest indeed, but with comparative calmness—one might almost say with a shade, though hardly perceptible, of contempt. Such supernatural business affects her but little, except so far as it all points in the direction she is intent on, and may help to bring her husband to do the deed that is to make him all the witches prophesy he shall be. It is true that Lady Macbeth presently bursts out into a magnificent appeal to the " spirits that tend on mortal thoughts," but this is a figure of speech. What she wants is not supernatural assistance, but the unsexing of her nature, the quelling of all " compunctions visitings." She perhaps foresees that it may come to be

desirable for herself to commit the murder, for she calls upon "thick night" to "pall" her "in the dunkest smoke of hell"—

That my keen knife see not the wound it makes,  
Nor heaven peep through the blanket of the dark,  
To cry, " Hold, hold."

In all this there is no sincere recognition of the supernatural, no recognition whatever of the Divine; and, curiously enough, when the time comes, and she enters the king's chamber, and leaves the grooms' daggers handy for Macbeth to find and use, she is stopped from herself committing the crime, not by one of the religious terrors which horrify Macbeth, but by a little touch of human feeling, such as in natures like hers long survive the true moral sense, and such as in her grand appeal to the "murdering ministers," who, in their "sightless substances, wait on nature's mischief," she prays may be eradicated. This fury, who could have plucked her nipple from her babe's boneless gums, and dashed the brains out—this murdereress in all but act, to whom

the sleeping and the dead  
Are but as pictures—

this scorner of ghostly terrors, who deems them mere "flaws and starts, impostors to true fear"—this firm contriver and relentless instigator of assassination, who dreads of all things that her husband will be too weak to kill his king and guest, and who would gladly save him from the necessity—yet turns away and leaves Duncan peacefully asleep, awaiting death from another hand. Why? Because he resembles her father as he sleeps. Macbeth would have thought as little of this as his wife would have thought of the grooms saying "God bless us."

Both are alike in this, that they do not let such or any considerations really stand in the way of their purposes. And so they go on to their future with this deadly remembrance behind them. It follows closely, clings to their garments, fills their hearts with forebodings, lines and tinges their faces with care. I have taken my illustrations early in the play, where the key-notes are struck, and I cannot follow into later passages, to which it gives fresh interest, the distinction between Macbeth and his wife which I have sought to draw. Enough that they are soon partners in undisguisable misery. Even when Macbeth thinks he is only concerned with the preservation of what he has gained, he is really succumbing to an undefinable oppression of his consciousness ; while Lady Macbeth—played according to the latest and best lights—watches, with yearnings which rapidly soften her moral impassibility, the perpetual fatigue and wretchedness in which her husband lives. A profound teaching is involved in the moral and spiritual poverty of their anguish.\* It never rises even to the level of remorse. It does not suggest in a single passage the presence of any reforming principle. Nay, it seems to be a doorless chamber, only lit enough to make its wretchedness visible to those within it, with the exit towards good and enfranchisement and regeneration harshly and hopelessly bricked up. The lesson of it is, that repentance may sometimes seem beyond human reach and desire, though many torments of sin may be desolating the heart. In other words, the moral of "Macbeth" is, that to have a conscience—the common gift of humanity—is not enough ; that to educate and stimulate the conscience may in many cases be the first duty of man.

\* Note the extreme simplicity, the almost unintelligence, of all the sensations of the murderer and murderer—even the most poignant—that are not connected with exigency. There can be no doubt that the second greatest temptation that could be offered to Macbeth (the first being assured kingship) was immunity from the consequences of black deeds.

I know I shall be charged with reducing "Macbeth" to the level of a Methodist tract. If I *reduce* it at all I am open to condemnation, for I profess to describe the true "Macbeth." But if Shakspeare was a Methodist, how can I help it? In this country we are all Methodists, more or less.\* We have passed from one Methodism to another ever since the religious sense of our nation was awakened—perhaps ever since Augustine evangelised us with *his* Methodism—perhaps even earlier. As soon as we find that old forms have lost their power over emotion, we get new ones. When all forms seem dead, there appears amongst us a Methodism, such as the Friends', which professes to have no forms. Nothing cures us of Methodism. Even science does not change us, but Methodism modifies science. Our scientific men become quite uncomfortable—not in mean dread of public opinion, but sincerely, emotionally uncomfortable—if they find their theories or guesses have drifted them away from Methodist moorings. Professor Tyndall writes Methodism in the November *Fortnightly*, and Frederick Harrison, the Comtist, pleads for his neo-Methodism, in the *Contemporary* from month to month. It was not likely that so typical an Englishman as Shakspeare would, in the religious region, differ from his countrymen; and if we ask ourselves what is most distinctive in the true "Macbeth," it is not the grandeur or the terror, which the dramatist shares with his Greek precursors; it is his keen analytical treatment of that heart-wrongness which is a main and perpetual subject of English religion and English art.†

\* We rarely sophisticate our vices either in fact or fiction. Even the gay Lovelace, inexhaustible in fancy and pleasantry as in enterprise with the fair, never pretends virtuously to himself or his confidants in any disguise. Macbeth never claims to be a "Saviour of society."

† "Of what kind are the moral conflicts in the ancient drama? They are only such as arise from the opposition between different single virtues and duties. Nowhere do we meet with the idea of the moral law itself in conflict with sin,

There have been many attempts to give a short title to this play, and the results have not been encouraging. If, however, I had to describe it as briefly as possible, I should call it a play in which is exhibited, in an action both tragical and supernatural, a conjugal partnership in reckless and homicidal ambition between two persons of differing, yet of equally ineffective, moral sense.

Those who, agreeing with this definition, know the history of the play since it left its author's hands, will agree also that criticism has done little to realise, and that the stage has only slowly approached, the true "Macbeth." The theatre, however, has done more than the critic. When Mr. Samuel Pepys saw "Macbeth," he wrote in his diary that it was "a pretty good play;" and we may be sure that that sensitive and tenacious gossip did not much misrepresent the tone of his contemporaries. Such acting as that of Garrick and his coadjutors first taught English society and English critics the true depth of the play, and then came the period, several times referred to, during which John Kemble and Mrs. Siddons stamped "Macbeth" with noble traditions of preternatural majesty on the imagination, not merely of

and becoming that divine justice which presides over human history, and visits sin upon the sinner. Even that very drama which is most consonant with our sentiments, the *Antigone* of Sophocles, is based upon a collision of separate duties—duty towards a deceased brother, and the duty toward the law of the State. Into such a collision I may be betrayed by fate, without any fault of my own. But I cannot come into collision with the moral law except by my own fault. The feature which makes Shakspeare a Christian dramatist is, that he refers all conflicts to such voluntary offences, though the transgression may be but slight, and have taken place in the inner world of the thoughts. Hence it is not the power of fate, but the law of righteousness, which he brings into prominence in the intricate fabric of human affairs." (Dr. Luthardt, Professor of Theology at Leipsic; who also refers to Fischer and Ulrici, and to Ehrhard's lecture on Shakspeare's "Relation to Christianity," in support of his view.) The accusation against the ancient drama is perhaps overcharged, but the tribute to Shakspeare's Christianity—his *Methodism*, in fact—is interesting.

England, but of Europe.\* We have all read the many stories of Mrs. Siddons. We know that she nearly frightened to death a young draper's assistant, by the tones in which she said, referring to some calico, "Will it wash?" We have all read her account of her first study of Lady Macbeth; how the horrors of the assassination scene wrought her to such a degree of excitement in the dead of night, that, unable to proceed farther, she hurried away, in a paroxysm of terror, candle in hand, to bed—how the rustling of her silk dress, as she went up stairs, seemed like a spectre pursuing her—and how, when she reached her chamber (this is a delicious touch, which shows the tragic *diva* was still a woman,) she found her husband fast asleep. All this, occurring to a young woman of twenty, who was afterwards to make her Lady Macbeth the Lady Macbeth of all playgoers and thinkers for a space of fifty years, is undoubtedly a great tribute to the power of the play. But it gives no guarantee for the truth of the great actress's interpretation, and it rather suggests that she went on a false tack, for the true Lady Macbeth, in the scene which nearly drove Mrs. Siddons mad with horror, except that she suffered deep wifely concern at seeing her husband so overthrown, and dread lest his unmanageable weakness should betray him, was not very seriously discomposed.† So

\* While physical advantages were no doubt the origin of the grander reading, they cannot vindicate misconceptions as sound. Let us hope, moreover, that even where robustness and physical majesty are absent, one may discriminate, if one tries, between new truth, which is born of brains, and eccentric feebleness, resulting only from deficiency of personal qualifications. Some, at least, of our grandfathers found the Kemble acting occasionally deficient in ideas. Charles Lamb said that the great John Philip "flagged sometimes in the intervals of tragic passion. He would slumber over the level parts of an heroic character. His Macbeth has been known to nod."

† It is not generally noticed, by the way, that Lady Macbeth, like women of later times with anything desperate and unwomanly on hand, had intentionally or accidentally fortified herself by drink. Very unsublime, but very Shakspearian, and saved as usual from vulgarity by the dramatist's art of expression—

That which hath made them drunk hath made me bold.

grand a picture, however, could not but seize on the public mind, and its magnificence was taken for truth to such an extent, that even Hazlitt, when in one of her last performances Mrs. Siddons threw in a little bit of nature, complained, in his published criticism, that her "Go, go," in the supreme last agony of the banquet scene, was uttered in the hurried, familiar tone of common life, without a sustained and graceful spirit of conciliation towards the guests.

To Miss Helen Faucit belongs the honour of first dissipating, in the interests of truth and nature, the great Siddons delusion, of showing the world something truer than the massive and monumental style of the Kemble school could realise. Students of the subject may remember an article in the *Westminster Review*, afterwards republished by its author, Mr. Fletcher, in which it was contended that statue-like simplicity was not the essence of the Shakspearian drama, and that to the picturesque complexity, which was its essence, Mrs. Siddons' massive person and sculptured genius were as essentially repugnant as they were akin to the spirit of the antique. The reviewer asserted that "Macbeth belonged to romantic rather than to classic art, and that to succeed in the character of Lady Macbeth an actress must not be a living statue, with the solemn tone of a voice from a shrine; more the sepulchral avenger of regicide than the sufferer from remorse for it; a supernatural being, the genius of an ancient oracle—a tremendous Nemesis." It is known that this essay—so far as I am aware the nearest approach yet made to a true criticism of Shakspeare's play—was inspired by Miss Helen Faucit's performances.

The gentle Rosalind and Imogene became transformed as she faced and comprehended the true meaning of the part which had been so long grandly obscured. Once instigated to iniquity, Miss Faucit's Lady Macbeth had no notion of

turning weakly back before the gains were made. Throughout the criminal passages Miss Faucit was true, as by hard feminine directness, to this principle. But, afterwards, weakness of temperament prevailed over strength of mind and will. In the scene where she read the letter, Lady Macbeth, as impersonated by Miss Faucit, could not resist the temptation to range wildly the supernatural region into which her husband's written words tempted her, nor as the plot thickened, and the robes of ill-gotten royalty weighed heavy from her weakening shoulders, could she stand up against the fearful depression which set in upon her when she found her husband fatally environed by spectral mementoes of the deeds on which their state was based.

This dual character of Lady Macbeth was specially illustrated in the banqueting scene. The ordinary custom is—especially if Macbeth is the "star," for such are the weaknesses of celestial beings—for Lady Macbeth to disappear in a rather common-place way at this point, when she figures for the last time in the action proper of the piece. Her subsequent absence is felt to be almost inartistic, and her sleep-walking, at best, a very elliptical acknowledgment of her poetical importance to the story. Miss Faucit, as if the inheritor of some unwritten stage direction of the dramatist, obviated all this by a wonderful elaboration of silent action at her exit. Even if the *dénouement* had been utterly unknown, it would have been impossible to witness the end of the banqueting scene without feeling that for her there could be, from that moment, no more crime or hearty enjoyment of the greatness secured by it—that by her the cup of life had been drunk, and that she would live in loathing of its lees. During the first excitement of the feast, and even during the first appearance of the ghost, the queen had her game to play, and played it royally. But with the second ebullition of her

husband's weakness, a new light broke in upon her. In a frenzy, she urged the guests to go ; then, fearing she had been too brusque, she bowed low, and bade a kind good-night to all. When she rose, after a moment or two, from that posture, she was a broken woman. There had settled over her bent head the gloomy shadow of an irremovable cloud. She had seen that her husband's malady was incurable, that their guilt had enveloped him in an impenetrable curse. She became simply hopeless. She staggered, and was faint. The consolation she gave her husband was given mechanically, and as if in sleep. She tottered to a table ; sat down at it ; rested her forehead on her hand ; touched, as by accident, the crown ; feeling it, took off with a melancholy, not quite absent, air, this "top and round" of her irretrievable wretchedness ; pressed her agonised brow the more freely for its absence ; and let it hang listlessly in her hand, as she marched faintly yet with persistent dignity from the scene of her fearful change. She was the last to leave. There were no train-bearers. Her gorgeous mantle trailed heavily on the ground. She was visibly in a dream—a dream of royal greatness which she must at all hazards support, while at her heart was gnawing the reality not so much of remorse as of doom.

This was very fine, but there was a fault in it ; and that fault was destined to be repaired by the insight of a young actress who, in understanding parts for herself, and in courageously acting them as she feels them, is second to no histrionic genius that ever flourished. The fault was egoism—Miss Faust was too much the paralysed queen, too little the stricken wife. Miss Bateman reversed this. Her queendom was forgotten, her wife's nature was filled with one great yearning, almost of despair, to soothe if she might and to heal if she could her husband's crushed and dis-

tracted mind. It is all suggested in the beautiful, wifely words, " You lack the season of all nature, sleep," but never till Miss Bateman saw it was this perceived. She adopted her conception of the part with her usual courage in all her provincial performances, years ago, when it seemed an audacity for so young an actress, known only in domestic and romantic drama, to essay the character at all. Now at last she has a greater opportunity. In a noble intellectual partnership — wonderfully harmonious, and contrasting grandly with the old state of things, in which, partly from confused ideas, and partly from professional jealousy, Macbeth and his wife were two great creatures, each grudging to seem less magnificent than the other—we see "Macbeth" played in London with all the truth of that conjugal union in high-reaching sin and its "judgment here" which Shakspeare desired to depict. Mr. Irving's contribution is his absorption at all points in the Macbeth whom Shakspeare drew—a Macbeth brave only on the field, but resolute is such wrong-doing as makes for his ambition ; a Macbeth whose strength is his unscrupulous cruelty, whose weakness lies in his constant liability to the horrors which Heaven in mercy, as well as in justice, has made, in some minds, at least, and those not always the least determined, the inevitable sequels of guilt. I will not dwell on blemishes. I am not here to deny that the play may have lost something in splendour of declamation, or that the chief actor has aggravated rather than corrected certain mannerisms of delivery that always beset him. I take the performance as a whole, and I take especially the scenes which I have indicated as keys. If you go to the Lyceum Theatre, and watch the two episodes in which Lady Macbeth wistfully follows with sad, tender gazes, and with unconscious gestures of appeal or soothing actions of wifely affection, the distraction and depression of Macbeth, you will, I think, acknowledge that

the new Macbeth is not far from being true. The inner truth of this play is wholly separate from its grandeur, except as both are expressed by its inimitable language; and is only partially and briefly identified with its incomparable beauty. But when the truth has been long obscured, and upon manifestation is rudely and crudely challenged, it is necessary to stand up for it. The grandeur of "Macbeth" may probably be best enjoyed by the fancy without scenic auxiliaries. Its beauty—except so far as it lies in Lady Macbeth's tender sorrowfulness—is somewhat clouded in a representation which undoubtedly does not as a whole sound the full diapason of the poet's matchless eloquence. But the truth is there, with but few and insignificant qualifications, and for its own sake, and for the credit of acting as the most efficient method of elucidatory criticism, cannot be too closely or admiringly studied. Surely every one must be encouraged and spurred to such study, who, going back to his Johnson, reads the extraordinary statement that this play "has no nice discrimination of character," the events being "too great to admit of the influence of particular dispositions, and the course of the action necessarily" determining "the conduct of the agents." I will add, that we can all feel what criticism owes to the stage, when we are told on the same high authority that the effect of the play is to make Lady Macbeth "merely detested." This, after all Shakspeare has done, by the suggestion of her wifely solicitude and self-abnegation, to shelter her with the gentle veil of pity! Well might Gervinus say that the clever player will always be a better interpreter of Shakspeare than the most learned commentator!

The suggestion I have myself made for the right reading of the play is a small one, but I am impressed with its ethical value, and with the fact that here at least criticism must advance where acting can hardly follow it.

Only in the greatest dramatists can we expect to find lying, half-lost amidst stirring action and bold spectacle, minute but pregnant casualties of moral being and character. None the less is it our duty to seek them out. We should not be deterred by any fear such as a great French critic has expressed, of appearing to embark on frivolous subjects. The delicate contrast between the hard-sinning of Lady Macbeth and the timorous sinning of her husband is founded in a difference of attitude towards supernatural religion which might be instanced in every company, and pursued into every relation of circumstances in which differing people have to make choice between good and evil. Such studies can never be unprofitable, nor will they ever cease to occupy the highest genius amongst a people saturated as we are with ideas of moral responsibility under religious sanctions.

For us there is no golden age of ancient beauty, nor any beaming vale of Tempe. Not for us are the rounded forms and seamless draperies of the Greek ideal. Not for us the lightsome laughter of pastoral gaiety, or the sunny merriment of sylvan revels. We cannot prattle and gesticulate in Gallic epigram, nor pose and declaim in Spanish pride, nor lose ourselves in Teutonic simplicities, nor find even in docile picturesque religion a talisman or an anodyne.

" We look before and after,  
We pine for what is not :  
Our sincerest laughter  
With some pain is fraught ;  
Our sweetest songs are those that tell of saddest thought."

And the truest of our great plays unfolds, not only the majesty and mystery of tragedy, but the common exigencies of daily morals.

## ON ELECTRICITY COMPARED WITH HEAT AS A SOURCE OF MECHANICAL POWER.

By J. CAMPBELL BROWN, D.Sc., ETC.

In what direction can we reasonably look for a substitute for coal?

Since the popular mind began to recognise the fact that the known sources of coal within our reach are rapidly becoming exhausted, and cannot last many hundred years, and especially since the advanced price of coal forced the attention of large employers of steam-power to the difficulties of the not very distant future, many persons have been induced, by the great advances which have been made in the practical application of electricity, to contemplate the substitution of electricity for heat as a source of mechanical power. From a scientific point of view there is nothing absurd or impossible in the proposition to employ electricity as a source of mechanical motion; although the probability or possibility of its being practically advantageous may be a subject for discussion.

The doctrine of the correlation and mutual convertibility of all the physical forces is now thoroughly established;\*

\* *Law of conservation of energy.* The amount of force associated with matter is definite and constant. Whenever a given amount of energy in one form disappears, it reappears as work done, either as motion, heat, light or some other form, the amount of which is exactly equivalent to the amount which has disappeared.

Mechanical equivalents of heat and electricity.—

The amount of heat required to raise—	When converted into motion, can lift—
1 lb. water .. .. .. 1° F.	1 lb. .. .. .. 772 feet.
1 lb. water .. .. .. 1° C.	1 lb. .. .. .. 1890 feet.
1 grammé water .. .. .. 1° C.	1 grammé .. .. 428½ metres.

The amount of electricity required to eliminate 1 grammé of hydrogen and 8 grammes of oxygen from water, is equivalent to about 34,000 units of heat = 14,400,000 grammé-metres.

and any one of these forces which happens to be at our disposal may be taken as reasonably as another for conversion into mechanical motion. Although a given quantity of one form of force always yields, when converted, an equivalent quantity of other forms of force, none of it being ever destroyed or lost, yet we are never able, with the imperfect machines which we can make, practically to convert the whole of a given force into the precise form of force which we require, nor can we ever transfer the whole of any force from one machine to another; a portion of the force is always converted into some form which we do not want; it is practically as bad as lost. The most familiar illustration of this impossibility is the loss of motion by friction, which occurs when we transfer mechanical motion from one machine or part of a machine to another; some of the mechanical motion is converted into an equivalent quantity of heat, and hence for mechanical purposes is lost. The greater the number of conversions into different forms which a given amount of energy undergoes before it reaches the point to which we want to apply it, the smaller will be the ultimate fraction available, and the greater will be the proportion of force lost, just as an increase in the number of different parts of a machine increases the loss by friction.

In the conversion of heat into mechanical motion by means of the steam-engine, so much heat is lost (using the word lost in a popular and unphilosophical sense) that only a small fraction, about one-ninth, of the heat generated in the furnace can be ultimately utilised as mechanical power. One pound of coal will convert rather more than ten pounds of water into steam; or will raise upwards of 10,000 lbs. of water  $1^{\circ}$  Fahrenheit, that is, it will do about  $8\frac{1}{2}$  millions of foot-lbs. of work. One grain of coal, when burnt, develops heat equivalent to about 1,215 foot-lbs., but it only enables the best Cornish engines to do 143 foot-lbs. of work.

In constructing electrical engines, the great difficulty hitherto has been to get a considerable fraction of the given force—electricity—converted into the required force—mechanical motion—without being dissipated in some other form, such as heat. It is true that Professor Jacobi constructed an electro-magnetic engine which propelled a small boat, with twelve persons on board, at the rate of four miles an hour; Mr. Robert Davidson drove an electric locomotive on the Edinburgh and Glasgow Railway at the same rate; and Professor Page constructed a four- or five-horse power reciprocating engine. An idea of the principle on which these machines were constructed, may be gained by examining the toy electro-motive pump placed on the table. No electro-motive engines have yet been made sufficiently perfect and convenient for general use, but there is no doubt that they can be very much improved, and that engines can be made, and probably will be made, capable of producing every variety of motion much more conveniently, and with much less loss of power, than any constructed upon principles hitherto known. By means of Gramme's machines, similar to the one upon the table, M. Breguet converted a known amount of motion into electricity by one machine, and then passing the current through the second machine, converted that electricity again into motion, and found the loss to be only thirty per cent. This is by far the best result hitherto obtained, and the motion is continuous and rotatory.

It is therefore desirable to enquire how far it is worth our while to endeavour to make electrical currents or magnetism more available as a prime mover of machinery.

An electro-magnetic machine ought to yield force equal to 112 foot-lbs. for every grain of zinc consumed in the battery; but in practice, only the equivalent of 70 or 80 foot-lbs. can be obtained as a current outside the battery for

each grain of zinc. Comparing this result with Cornish steam-engines, which do 140 foot-lbs. of work for every grain of coal consumed, and remembering that zinc costs twenty-eight times as much as coal, we see why electric-engines cannot compete with steam-engines ; the work of the former costs fifty times as much as the work of the latter. A further reason, as has been hinted, is found in the fact that steam can be far more easily, perfectly, and conveniently applied as a prime mover than electricity.

The source of the power of a steam-engine is the chemical force resident in the coal and the oxygen of the air. 1st, chemical force is converted into heat; 2nd, heat is transferred with great loss to the water and steam in the boiler; the steam is conveyed, with more loss of heat by conduction and radiation, to the cylinder; where, 3rd, it expands against the pressure of the outside air and the resistance of the machinery, and heat is thus converted into mechanical motion, with still more loss by friction.

In like manner, zinc is the fuel of an electrical engine; and the source of its power is the chemical force resident in the zinc and the acid of the battery; 1st, the chemical force is converted into an electrical current with considerable loss in the form of heat; 2nd, the current is converted into magnetism; and, 3rd, by attracting movable bars suitably placed, magnetism is converted into mechanical motion, with great loss arising from the decrease of attractive power in the ratio of the inverse square of the distance, and from heating and other causes.

(The loss of force, arising from the decrease of magnetic attraction as the square of the distance of the attracted body increases, is one of the chief difficulties in the way of the employment of magnetism as one term in the transformation of force in useful machinery; and it appears to me to be the only point in which Gramme's machine is placed at a disad-

vantage when compared with previous magneto-electric machines, which in other respects it excels.)

By perfecting our batteries a larger proportion of the chemical force resident in the zinc will no doubt be made available as a current; and, in like manner, by economy of fuel, improvements in furnaces and boilers, and by preventing the escape of heat, a larger proportion of the chemical force resident in coal will be utilised. We must therefore calculate the relative economy of the two sources of power on the supposition that all the chemical force originally resident in the molecules of the zinc and fuel is utilised; and it will be convenient to compare pure zinc with pure carbon rather than with coal.

It may be borne in mind that 125 parts of coal\* are equal to about 80 parts of pure carbon. One grain of zinc, dissolved in sulphuric acid in the battery, yields sufficient heat to raise 0.146 lbs. of water 1° Fahr.; calculating this into its mechanical equivalent, we get 1 lb. weight raised to the height of 112 feet, or 112 lbs. raised 1 foot.

One grain of carbon, burned in oxygen or air, yields heat sufficient to raise 2,007 lbs. of water 1° Fahr.; the mechanical equivalent of which is 1,603 foot-lbs. It appears then that carbon contains  $14\frac{1}{4}$  times the store of force, which is yielded by dissolving an equal weight of zinc in sulphuric acid. The reason why zinc yields so little force in this manner, is that a large proportion of the heat evolved by

• 1 lb. carbon yields .. .. .. ..	11,227,968 ft.-lbs. of force.
1 grain carbon yields .. .. .. ..	1,604     "     "
1 lb. coal yields .. .. .. ..	8,887,600 to 8,916,600     "     "
1 grain coal yields .. .. .. ..	1,200     "     "
1 lb. zinc yields, when dissolved in sulphuric acid .. .. .. ..	774,800     "     "
1 grain zinc yields, when dissolved in sulphuric acid .. .. .. ..	112     "     "

(If our natural supply of carbon were exhausted, it is true that electricity could still be obtained at moderate cost from other materials; for instance, from iron pyrites and zinc blende, or galena, with sea water, as an exciting liquid; but the weight of material required would be far too great to allow this source to be used for locomotive and many other purposes, even if the strength of current thus obtained were many times greater than it is.)

Should electricity ever be obtained as heat is now, directly from carbon, in quantity equivalent to the whole of the chemical force resident in the carbon, it offers many advantages over heat which would render it desirable to perfect our machines for converting electricity into mechanical power.

Although, as has been said, there is no prospect of our ever using electricity for the generation of mere brute force, it is not to be inferred that endeavours to construct new electric-engines should be discouraged even at present. Great as has been the development of useful applications of electricity during the last quarter of a century, still greater triumphs are doubtless in store for it. But it can only be usefully employed for purposes to which its properties render it peculiarly applicable, and for which the greater power of the steam-engine is not conveniently available. Some of these purposes will be suggested by a few illustrations.

1. Electricity can produce a more intense heat, and therefore a more intense light, within a limited space, and better under control than combustion.

2. Electricity can be generated at one place, conducted to another place at a great distance, and be there used for generating light, heat, or motion; and can be controlled by a person situated at the point of generation, or the point of application, or at any intermediate point. Thus, by the electric telegraph, a person situated at the battery, or any-

where along the line of wire, can produce whatever signals he chooses, at one or more places at any required distance ; or, in a similar way, he can ring a bell or do any kind of work. By the electric clock the motion of a carefully-regulated pendulum at Greenwich can regulate the motion of any number of other clocks, situated at any distance from the first and from each other. Other applications of a similar kind will no doubt be multiplied.

3. In electro-plating and the production of electro-copper, a current of electricity, generated by a battery or by a Gramme's machine, is employed to restore the metals to the free state, with their full complement of chemical force resident in them ; and the metal deposited by this means is both purer and deposited in a more uniform film than it could be if it were reduced by means of heat.

The chemical applications of electricity might be indefinitely increased.

The power of transferring force to a distance in the form of electrical currents, is one of the most important advantages which electricity offers for practical purposes, and is likely to be extensively applied in the future. It has been proposed by M. Nolet to convey motion from place to place by pneumatic tubes, and a company has been formed for that purpose. Now, there is no form of force which can be so readily and economically conveyed to a distance as electricity, which can be distributed to a multitude of different places instantaneously, and so as to be completely under control at any point along the circuit. It might be advantageous, therefore, in many cases, to convert motion into electricity at a point where motion can be obtained most cheaply, and convey it by wires to those places where force is most wanted, and there re-transform it into motion, or into any other form of energy which may be required.

A committee of the British Association has been

appointed to investigate and report upon the utilisation and transmission of wind- and water-power ; doubtless they will include in their investigations both pneumatic pressure and dynamical electricity ; and it is evident that if electricity could be as readily converted into motion as it can be transformed into heat and light, the cost of its transmission from a water-wheel or a tidal reservoir or a windmill, to a great distance, would be very greatly less than the cost of the conveyance of pressure by pneumatic tubes. If coal could be consumed so as to generate electricity directly without loss, the force might all be generated at the pit-mouth, and transmitted to the consumer by wire.

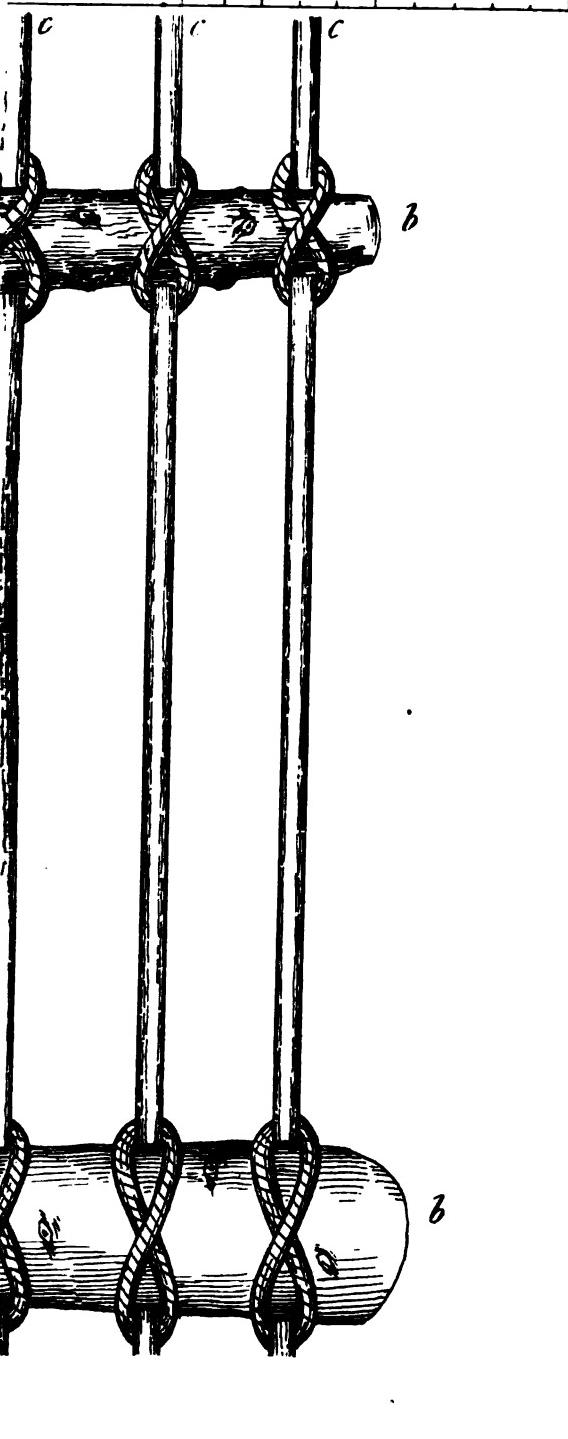
Let us return for one moment to the question with which we started. Where can we reasonably look for a substitute for coal ? There neither is nor will be any substitute for coal, if in that term we include petroleum, oils, peat, and wood ; in short, carbon and hydro-carbons. Force cannot be created, it must be obtained from previously existing stores of force, and when it has been equally distributed there is no collecting it again. We must economise our carbon, and when it becomes exhausted, we may utilise the force of the sun, growing wood by its light, warming ourselves, producing evaporation, or obtaining mechanical power in the shape of wind from its heat, and obtaining mechanical motion from its attraction, and that of the moon, by means of the tides ; but in the earth itself, apart from other worlds, we can expect to find no store of force, either in the form of chemical force, heat, light, or electricity, which will take the place of our carbon deposits. We may learn to do without coal, but we can hope to find no substitute.

## SCALE OF FEET

10

5

0

*a a Represents**b b Represents  
naturally or mad  
trees are lashed on**c c c Represents  
bamboo—which is  
on to the main wa**The blue dots  
18 inches are given  
from back to front.**Both sides of  
the main timber  
of the stone and  
and c5 are all made  
side of the stone.  
600 persons to carry**If the cross pi  
each person.*



## ON A MEANS EMPLOYED FOR REMOVING AND ERECTING MENHIRS.

BY THOMAS INMAN, M.D.

It is probable that there are few who have either read or travelled much who have not had their interest incited by seeing or hearing of the enormous masses of stone which have been moved from one place to another, by people who are supposed to have had few, if any, of the modern appliances used by our engineers. The huge size of the stones employed in the temples of Baalbec and Palmyra, and the gigantic masses in Egypt, known as the Great and Little Memnon, have long arrested the attention of archaeologists; whilst, in more modern times, we have been able to get a reliable historical account of the removal to St. Petersburg of the vast fragment of rock upon which the colossal statue of Peter the Great reposes.

We in England have had our curiosity aroused by seeing such massive stones as exist in Stonehenge arranged upon a definite plan; and those who have visited Stanton Drew, near Bristol, may see great lumps of undressed stone, of lesser height than those of Stonehenge, but of greater weight.

The highest stone set upright which we have in England, is in a churchyard in Rudstone, in Yorkshire. Of this, 12 feet are buried, but there are 29½ feet above the surface of the ground, giving a total length of 41½ feet.

At Loc Maria Kir, in Brittany, the ancient Armorica, there is a fallen menhir, which, having been originally placed upright, has fallen or been thrown down and fractured into four fragments. Its total length is 61½ English feet, and the weight of the block is calculated at 260 tons.

The weight of some of the stones in some of the Egyptian pyramids exceeds this, and the weight of the Great Memnon is far greater.

The problem how these enormous masses have been moved has often been discussed, and it would be useless for me to enter on this wide subject. Layard has found a solution of a part of the matter in *Ancient and Modern Assyria*, having transported the enormous human-headed bulls a considerable distance, by means of a rudely formed truck, drawn by the main force of some hundreds of men. Pictures found in the tombs of Egypt have also shown us that the chief means employed in the conveyance of enormous masses of stone was the sheer strength of numbers.

It is interesting, as I may notice in passing, to observe that the fishermen and women in Italy employ the same method of hauling on the two ropes of their large nets as were used by the Egyptian slaves. Each one has a broad band, which falls from the left shoulder to the right hip, and there terminates in a limp cord, having a large leather button at its free extremity. The free end is struck upon the main drag-rope, and at once laps so tightly round it that the man can at once throw all his weight into the shoulder strap. By this means the main rope is never weakened, and the person can, as soon as he has reached the upper margin of the shore, unfasten himself from that part of the rope, and go seaward to take his place once more at the drag.

Again, in the Lateran Museum at Rome, there is a sculpture which depicts the powerful movable crane which was used in building by the Romans.

But, in the cases referred to, there has evidently been considerable artistic knowledge, and the engineering, however rude, has been directed by thought and skill.

I desire rather to call the attention of the Society to those cases in which there cannot be said to be any engineer-

ing knowledge at all, at least in the ordinary sense of the word, and in doing so I shall confine myself, as far as possible, to the erection of upright stones or menhirs.

I scarcely need tell the Society, that menhirs have been erected in countries widely separated. One may find them from the east of India to the west of Europe and the British Isles. Stone circles exist in the Dekkan, on the east, which do not essentially differ from the stone circles in Cornwall, and much ingenuity has been exercised in the endeavour to form a reasonable theory about the idea which has occupied the minds of those who raised them up.

When a party has long been wandering in a mist over an extensive plain, it is a great pleasure to discover something which is real; a something which will act as a landmark, and unite the different members in their previously divergent opinions as to the proper track.

Having long had an interest in this subject, I have never lost sight of an opportunity of making inquiries about the matter from those who have been in India, and especially in those parts where menhirs are very common. Not long ago it was my good fortune to spend a long evening in the presence of Mr. Greey, a civil engineer, who had been stationed in a somewhat out-of-the-way district in Hindostan, to prepare for and to lay a railway. To me his conversation was full of interest, for he was a keen observer and a shrewd man. Amongst other things, I may notice that from his own observation he had come to the same conclusions as my friend, Dr. Oldham, has done, viz., that "malaria," in the ordinary sense of the word, does not exist, and that the cause of ague, remittents, etc., is exposure to cold after the body has been exhausted by the heat of the sun and toil. But the most striking part of his discourse was that which treated about menhirs; and I was extremely desirous that he should put into writing, for one society or another, that which he

told me. He promised that he would, but he died suddenly a few days after I saw him, and, as he left no written memoranda, I am obliged to draw upon my memory.

This I regret much, for, in the first place, I dare not be quite sure what people of India he was speaking of. I made a note of it at the time, in pencil, but the word became obliterated in my pocket during a shaking railway journey, but I think that Mr. Greey called them Khasias, and I feel more supported in this recollection by having found out, since our chat, that these people have already been described as menhir raisers.

A good account of this tribe is to be found in the *Journal of the Anthropological Institute of London*, October, 1871, and which was written by the pen of Major Godwin Austen, of the Topographical Survey of India. The people in question are a large tribe living on the highlands of the north-east frontier of Bengal, and occupy what are called the Khasia Hills. Of these Major Austen writes, "Certainly the most striking objects of interest in the Khasia Hills are the upright stone monuments that are to be seen all over the country; these, set up by the wayside, or in the villages, more frequently cutting the sky on prominent hills, with the large slabs horizontally set before them, at once recall the Druidical remains of our own island. The tall upright stones are called 'Mao Bynna,' equivalent to 'a stone to make known.' They are also known by the term 'Mao Shinran,' the male stone, whilst the flat seat-like slab in front is called 'Mao Kynthi,' the female stone, representative of all life being in pairs. Without the slab the monument would be imperfect. These stones have nothing whatever to do with death or burial or with any funeral obsequies. The monument simply perpetuates the memory of some person long deceased, who, as a spirit, has watched over and brought good fortune to a descendant, race, or clan. Thus, a certain old

woman, of the Kür clan, not famous for anything particular during her life, but to whom many virtues were assigned after her death, for the particular sub-clan (Nonglariang) to which she belonged, from being very poor, became wealthy and prosperous under her guardian angelship. To honour this person, sixty years after her death, five well-cut stones were erected to her memory, and as the clan continued to prosper, it added, on the other side of the road, but opposite to the former, another line of five stones."

The stones are never erected in even numbers, and the most common numbers are 8, 5, 7; even numbers are considered imperfect; and though at times the stones are arranged in a circle, they have generally a linear arrangement, as have those at Karnak, in Brittany.

Sometimes the stones are erected under a vow—a sick man, perhaps, promising to erect a stone, or stones, to an ancestor, in case he should recover.

In setting up these stones, all members of the community are under an obligation to assist, without other payment than a slight repast when the work is done. But the stone-cutters are paid, and a rude music is made to entertain them during their labours.

Major Austen said, that he never saw the process of raising a stone into the upright position, but he saw the spars which had formed a sort of cradle, on which the last stone erected had been moved. They consisted, he says, of strong curved limbs of trees, roughly smoothed and rounded, and would present a very small surface to friction. These stones, he adds, had been taken from the side of a hill near, and had apparently been wedged out of the face of a step in the exposed sandstone strata. It is clear, on this occasion, that main strength was used in dragging, and not in simple carrying. Sometimes granite is used, and the following gives an idea of the size of the largest slabs the Major saw. One of

granite was  $18\frac{1}{2}$  feet long,  $3\frac{1}{2}$  feet broad, and 9 inches deep—49 cubic feet. The highest sandstone menhir seen was  $18\frac{1}{2}$  feet high, 8 feet 4 inches broad, and 1 foot 8 inches deep—104.7 cubic feet. The largest slab of granite was 30 feet 4 inches long, 10 feet broad, and 1 foot thick — 329 cubic feet,—and in weight equal to nearly 24 tons.

In a conversation that followed the reading of Major Austen's paper, reference was made to the old method of using fire and water to detach large blocks from the parent rock, but into that I do not profess to enter, as the art of cleaving stone and dressing it would deserve a paper to itself.

I now come to the description which Mr. Greey gave to me of that which he saw, and this was the simple transportation of a large block up a hill 4,000 feet above the starting place in the course of three or four hours. The weight of the stone, Mr. Greey estimated at between 20 and 30 tons, and we may compare this with the largest stone mentioned by Major Austen. When my informant came upon the scene, the stone was placed upon two long trees—pine most probably—which were placed horizontally and parallel to each other, one at the head, the other at the foot of the block. These were retained in their places by being lashed firmly to the slab; each projected a considerable distance on both sides of the megalith; and at intervals of about 36 inches from each other, cross ties were lashed, parallel with the stone, and with the ends projecting beyond the first and last tree. This arrangement divided the cradle on each side into parallelograms, into each of which sixty men could pack themselves, two abreast, each man having a firm hand-hold of the secondary bars, *i.e.*, those parallel to the stone. In the rows nearest the block there would only be one line of men, and it would be the same on the outside cross piece, so that taking the breadth of a man to be 18 inches, and his depth 12, there would be room for about 60 people, who

could easily lay hold on the wood beside them. According to the plan, sent herewith, you will see that there is room for 600 bearers, and as I take the weight of the block and frame to be, say, 26 tons, there would be 600 persons to carry about 520 cwt., less than 8 stone per man. This certainly is not more than men, even Hindoos, can readily carry. At any rate, my departed acquaintance told me that he saw the company assembled, which he did not count, take each man his place, and, at the word of command, raise the vast block, and walk off with it to the hill top, 4,000 feet, as I understand, without a stop.

I can well imagine that the members of the Society will here draw their breath, and say, oh ! I certainly should have done so myself in days gone by ; but my experience in Italy, and notably at Amalfi and its environs, showed that the country people who were, in comparison to me, a set of meagre scarecrows, could ascend a steep hill, some 8,000 feet high, with a huge load of paper, flour, or other material, which I doubt whether I could have lifted from the ground, and with the same apparent ease as I could without a heavier burden than my clothes. Having seen the Italians carrying these heavy packages ; having seen young lads in Switzerland carrying, for hours together, and without a rest, the luggage of a party of gentlemen ; and having read much of what Swiss, Tyrolese, Spanish, Portuguese, and other women do, I am quite prepared to believe that even a weight of 12 stone per man could readily be borne up hill by the Khasias, and for many hours without a rest.

Well, the stone was carried up the hill to its resting-place. It remained there to be erected. Whilst the folks who had been the bearers in a body rested for a while, a few of their number dug a hole at the spot where the stone was to stand.

Here let me remind members about the way in which

painters or builders raise a long ladder. Some are told off to lift the ladder, and one has to stand on the other side from them and at the ladder's foot. This is to prevent the wood sliding along the ground when it is raised somewhat above the horizontal, on its way to the perpendicular. What the painter does with his weight, the stone erector does by making a hole in the ground. Into this the largest end (generally, but not always) is lowered by cutting all the lashings of the lowest tree. The stone thus becomes "slantendicular," as the Yankees say, and the men who were engaged upon carrying the lower part occupy themselves by unloashing the lower tree and cross pieces, and by casting ropes round the upper tree and its cross pieces. Then the upper tree is manned by ropes, upon which all, except those who have to look after the hole, and fill it in as the stone becomes erect, can haul. The loosened cross pieces do not lose all their hauls, which remain attached, so as to keep the balance true. At length the mass is upright, and the hole in which its lower end stands is filled in. The whole process does not occupy more than three or four hours, and, as may be seen by the account of Major Austen, it is a very inexpensive one.

Once I might have doubted whether neighbours would help each other without a money consideration, but having read much of "building bees," or "harvest bees," or "draining bees" in America, when everybody within thirty or even sixty miles will come and help a neighbour without other remuneration than decent food, whiskey, water, warmth and dancing, I can doubt no longer.

Again, few people can doubt the power possessed by numbers of men when they are directed so as to apply their respective energies simultaneously. The fishermen on a beach combine together to haul their boats up high and dry on the shore, and we see that which one man cannot stir, rapidly run away with by a score or more. In like

manner, if we go into an iron forge, we may see a heavy forging, of thirty or forty tons weight, turned over by some thirty or forty men as if it were a straw in the fingers of a pigmy.

Indeed, there is little that is wonderful in the method adopted by the Khasias for transporting heavy blocks of stone, and it is the very prosaic character of the proceedings which deprive us of much of our interest in them. We would, from long habit of thought, have preferred to be told that the people who erected Stonehenge and Stanton Drew, the stones of Stennis, and that of Loc Maria Ker, had in their possession a wonderful engineering secret, which, with the death of the people who erected those monuments, had passed away from the world. The result seems to us to be something like the birth of a mouse after a mountain had been shivering with an earthquake.

Still more vexatious is it to know that these pillar stones, and their accompanying slabs, are not now erected—whatever may have happened in the past—to commemorate the death of a king, a priest, or a warrior; they do not rise with any sentimental idea such as has been associated with the spire or minaret, nor are they put up simply as an act or evidence of any particular form of faith. They are nothing more than a somewhat prosaic means to express thanks for good luck which is supposed to have been brought about by the intercession of some ancestor.

But I may pause here for a moment, to call attention to the evident fact that these rude Khasians have as strong and living faith in the existence of immortality as even the most vigorous churchmen in Great Britain. It would seem that they have a tradition that their tribe came from the East; and we may well believe that their notions about the influence of their dead relatives has come from China, wherein a faith in the power of dead ancestors is conspicuous in every position of life.

The question might now very naturally arise—"Is it possible that these modern Khasias are the representatives of the pillar raisers of Western Europe?" I see no reason to doubt it. In the Dekkan (India), Col. Meadows Taylor has shown us that there are stone circles, cromlechs, and kist-vaens, which do not in the smallest degree differ from those in Cornwall and Western Europe generally. He has explored tombs in Central India, and found that the burial rites had evidently been the same as those practised by the Scythians. Other explorers have found similar burial places in the Crimea, and Col. Taylor has found precisely the same kind of funereal remains in Yorkshire.

Early history has told us that the Scythians spread themselves more widely in Asia and Europe than any other nation; and we know that the Russian is the same, both in manner and language, from the east of Asia to the west of Europe.

But, where it is impossible to obtain certainty, it is useless to drive an argument too far. The use of observations, such as I here indulge in, is to help us to understand, and retain in our memory, such facts as we know, and to induce us to associate them with others. Philologists have for a long time, and with a strong show of truth, endeavoured to prove that a people coming from Central Asia gradually spread themselves, by successive waves, from the Himalayan highlands and Bactria as far west as Britain; and if, where they trace language, we can also trace similarity of custom, we may assume, either that the language and the customs went together, or that the one preceded the other. If one observer traces the Aryans from Asia to England by their language, another may be allowed to trace the Scythians from Thibet to Ireland by the remains, not of language, but of customs.

If we permit speculation thus far, we may fairly guess

that each menhir of Africa, Spain, Brittany, England, Scotland, and elsewhere, may represent the gratitude of a family or a tribe for a series of good hunting seasons, and possibly a successful war against wild animals, as well as for the gain of a pitched battle against earlier settlers, if there were any, or subsequent invaders, if the Scyths were the first colonists.

It is not pleasant altogether to have one's belief, that the menhirs and stone circles represent a rude but distinct form of religious faith, rudely shaken by an appeal to moderns who still erect the same kind of monuments as did the ancients ; yet we ought to be thankful for any light which is found to illuminate, even imperfectly, the dark grotto of doubt. If we accept facts in this spirit, we may fairly calculate upon an advance in knowledge.

I may, in conclusion, say a word about the antiquity of the custom still common amongst the Khasias. The only menhir of whose age we can reasonably judge is, as far as my knowledge goes, the Caaba of Mecca, which had in front of it a hole instead of a slab. This stone was for an indefinable time sacred amongst the Arabs, prior to the time of Mahomet. Its only claim to respect was its high antiquity and its unknown origin. This was prior to the prophet of Allah assuming his mission, about A.D. 600.

The custom of raising commemorative stones, however, can be traced back as far as the time of Jacob, whose stone, raised at Bethel, is often referred to, as is also the stone called Ebenezer, which was raised with much the same idea as the Khasia menhir, viz., not to commemorate a battle, but as a thank-offering for good fortune. It is probable that the Caaba was erected with the same view, and at a period when wars, and consequent good fortune to one tribe or another, were common.

The Romans did not do much in the way of erecting menhirs, but they had an expression, "Mark this day with a white stone," whenever particularly good luck had befallen them.

This Roman custom may be said to be a survival of a savage habit, and, if so, we must conclude that the British and French upright stones were not the work of our Roman invaders.

We have improved, both on the stone pillars and the white stones, for we erect memorial churches, and place a fine stained glass window in a cathedral, from the same cause that a Khasia would raise a menhir.

ON THE KHĀSI HILL TRIBES OF NORTH-EASTERN BENGAL, AND ON THE GEOLOGY OF THE SHILLONG PLATEAU.

By ALFRED MORGAN,

CORRESPONDING MEMBER SMITHSONIAN INSTITUTION, WASHINGTON;  
HON. TREASURER GEOLOGICAL SOCIETY, LIVERPOOL.

THE allusions to the Khāsis in a Paper recently read before this Society by Dr. Inman,\* interested me so much that I made diligent search for, and have had much pleasure in reading, the scattered papers on the people and their territory that have been within my reach; and as the information is not very readily attainable, I thought a few notes might not be unacceptable to the Society, and might appropriately follow that communication.

Dr. Inman, in his Paper, mentions this people as one of the few existing races that still continue to erect those monolithic monuments which, like the menhirs of the familiar Stonehenge circle, wherever they are found, awaken our curiosity as to the builders of them, and the purpose they were intended to serve. I agree with Dr. Inman in the opinion he forms, and which he shares with Major Godwin-Austen, that these structures among the Khāsi Hills were and are erected as memorials of the dead; but it is not my intention to discuss that question now.

It is extremely interesting to trace the geographical distribution of these monuments, and we are probably correct in assigning an eastern source as the centre of their inception. But I would suggest that the Khāsis may be more justly regarded to have a collateral rather than as a lineal

descent from that source. The people have, indeed, a tradition that they have come from the eastward, but there is no proof of any great antiquity that can be brought forward in connection with the megalithic and monolithic structures of India. We know but little of the pre-historic people who raised similar monuments in Europe, but we look across Asia to the distant East as the direction from which they came.

The region inhabited by the Khāsi tribes is the central portion of what has been denominated by Mr. H. B. Medlicott, of the Indian Geological Survey, the Shillong Plateau.\* Cherra Poonjee, the principal station, is situated in latitude 25° 16' 35" north, and in longitude 91° 43' 15"† east. It is 4,120 feet above the sea level, and is 3,000 feet above the level of the plain of Sylhet.

The overland route to China would traverse these plains, and, from a natural history point of view, there are few districts surpassing it in interest. The entomologist is familiar with the locality in connection with several species of Orthoptera.

#### MANNERS AND CUSTOMS.

The principal source of our information, with regard to the manners and customs of the Khāsis, is a memoir from the pen of Major H. H. Godwin-Austen,‡ a name well known in all departments of Indian anthropology and natural science. Accompanying this paper is a series of sketches of the menhirs and cromlechs which are usually, indeed, the centre of interest in all the papers in which the Khāsis are mentioned.

Dr. Hooker refers to the people and their monuments in his *Himalayan Journals*, and again in his Address as Presi-

\* *Memoirs of the Indian Geological Survey*, vol. vii., p. 152.

† Approximately.

‡ *Journal of the Anthropological Institute, London*, vol. i., 1873.

dent of the British Association, at the Norwich meeting in 1868, and remarks the circumstance that no archaeological treatise on the subject of monolithic circles, etc., contains a reference to the Khāsi monuments.

The most valuable paper on the physical geology, meteorology, etc., of the Khāsi territory, is by Dr. Thomas Oldham, Superintendent of the Geological Survey of India, and is contained in vol. i. of the *Memoirs* of the survey.

The papers by Mr. H. B. Medlicott, Deputy Superintendent on the Geology of Assam,\* and on the Shillong Plateau,† complete a series of singularly interesting and valuable memoirs, replete with vivid descriptions of scenery, and details of suggestive phenomena. Some of the geological sections differ from what has been observed in the sequence of European formations.

There only remain to be mentioned the papers of the Rev. J. Pryse, of Calcutta, published in the *Calcutta Review*, which are the source of much of our information on the religion, etc., of the people.

The various modes in which the word Khāsi has been spelt by different writers, is puzzling to European readers. It appears as Khassyah, Kasia, Cossyah, etc.

On the maps issued under the authority of the Great Trigonometrical Survey of India, the Jonesian system of orthography is adopted; and on the maps of the Revenue Survey, issued from the same office, Gilchrist's method.

The difficulties in the way of the attainment of anything like uniformity in the spelling of geographical names is very great. No two travellers have the same appreciation of sound; and words which have never, perhaps, been written, may appear to one to be correctly represented upon paper by a combination of letters, which to another may convey an

\* *Memoirs*, vol. iv.

† *Ibid*, vol. vii.

almost opposite sound. Nor should we expect that the majority of the individuals of a primitive race, with whom a traveller may converse, would pronounce a geographical or other name precisely alike.

Major Austen observes that the people call themselves *Ki Khāsi*, and their country *Kā Ri Khāsi*; and he suggests, as a derivation of this word, the Hindustani *Ghāsi* = grassy, the whole of the country being of this nature. "G," he says, "in words of Hindustani origin, has the sound of K."

Nearly all writers agree in the testimony they bear to the superior morality of the people, contrasting it with the lower degree that suffices for their neighbours inhabiting the plains. If, as Dr. Hunter, in his *Rural Life in Bengal*, observes, it is to the hill tribes we must look as the principal sources of the future invigoration of our Indian empire, this is an important fact.

One of the customs of the people that is conducive to morality is, that the young men of their communities shall reside apart in a Bachelor's Hall.\* In this building they not only sleep, but take their meals also.

In the Khāsi funeral rites there is much that is wonderfully strange, and were we able to explain their meaning and significance fully, would prove of great interest. Probably, the symbols of the intuitions of a remote era survive in these rites.

Cremation is the custom among them, and the calcined bones and ashes are placed in small earthen vessels, and buried. Each clan or family has its own burying place, which is usually marked by a conspicuous stone structure, though the remains are not consigned to these bone receptacles until a considerable time has elapsed, often a year or more, after the burning of the body. Mr. Pryse considers

\* C. Brownlow. *Proceedings Asiatic Society of Bengal*, No. i., 1874.

that this collection of the bones of a clan into one vault is due to the impression that the souls of the departed may all mingle together again in one large family, without trouble or suffering. The idea of any member of his family being a wanderer in the other world, cut off from and unable to join the spirit circle of his own clan, being most repugnant to the feelings of a Khāsi.

They have no temples, nor idols, but believe in dæmons, and suppose themselves to be in communion with, or in the power of, the manes of their race. Every dark, shady wood, every stream, every conspicuous hill, has its presiding dæmon. They suppose the spirits of the departed are always in close proximity to the residuum of their mortal bodies; and Major Austen makes some interesting remarks on the extreme care that is taken to preserve the family remains intact.

When a chief or person of eminence dies, it is usual to preserve his body in honey, in its coffin, for some length of time. This custom is not peculiar to the Khāsi; it is shared by them with the Burmese and the Persians.\*

Among the hill tribes, generally, a strange custom prevails of breaking eggs as a mode of augury. The number of eggs that are broken on an occasion of enquiry averages about twenty. The exorcist throws the eggs singly, with all his force, upon a board that is constructed for the purpose. The position of the chips of egg-shell that result is supposed to indicate the answer that is sought. The egg is personified and addressed thus :—"Egg ! I am but a man, am ignorant, and can divine nothing ; you can commune with spirits, and between man and them you have intercourse. Now, say ! who has done this ? or who has caused this man to fall sick ? If the spirit is in this house, let the signs be on the right ; if out of the house, on the left," etc.

\* Crawfurd's *Embassy to Siam*.

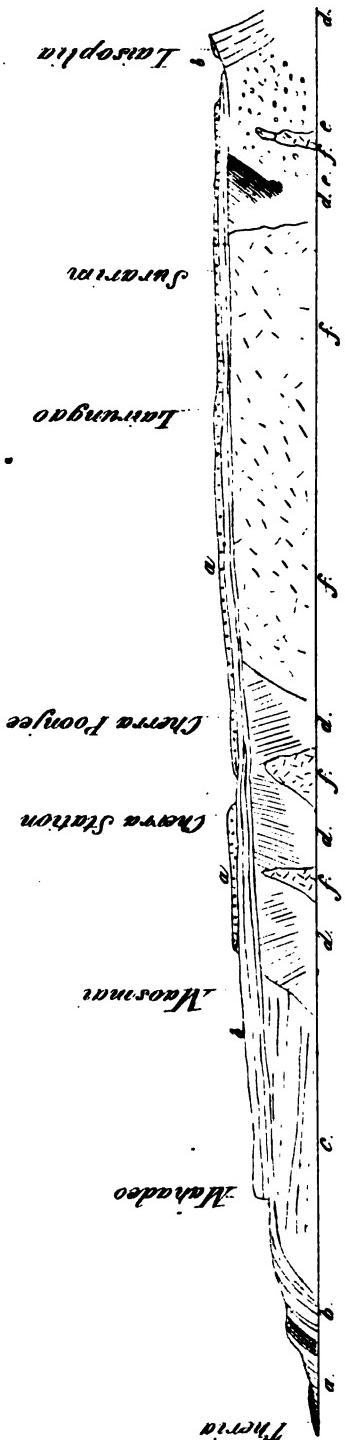
It would appear that those pieces of shell that fall beyond where the egg has struck are the representatives of spirits that are not implicated in the matter in hand; while those pieces that fall near the operator indicate that the sickness is due to natural causes.

The prevailing belief being that sickness is caused by dæmoniacal agency, the people sacrifice fowls, pigs, etc., to propitiate the molesting spirit; and it is usual for them to inspect the liver of the victims they offer, for indications or omens of the acceptance or rejection of the sacrifice.

Though there are several other topics of interest that might be mentioned in connection with the manners and customs of the people, I have not time to do so on this occasion. There is, however, one strange custom, called "Tarroo," which will, no doubt, be recognised as analogous to a custom prevailing among some other rude races. An unfortunate individual is supposed to be in league with a dæmon, and, in order to clear his character, he has to throw away every vestige of property he possesses, and begin life anew. He is deserted by everyone until his restitution is accomplished. The abuse of such a custom is unlimited, and it will be seen that it offers a ready means of effecting the ruin of anyone of whom two or three persons may be jealous.

In bringing this short *résumé* of the Khāsi customs to a close, I may just remark that I have not succeeded in finding an ethnological theory of the people. The anthropology of the Indian Hill Tribes is as yet but little investigated. It is probable they have all descended from a common source, and their characters have been subjected to powerful modifying influences on every side.





Geological Section from Thoria to Sainjolia Hill  
through Cherra Ponice - Meedikott. Geol. Survey of India.  
Scale 2 miles - 1 inch.

- |                |                     |
|----------------|---------------------|
| a. Nummulites  | d. Shillong series  |
| b. Cretaceous  | e. Khasia Gneissone |
| c. Silhet Tufs | f. Granite          |

## PHYSICAL GEOLOGY, ETC.

The length of the Shillong Plateau, from north to south, is about 250 miles, and the average width is about 25 miles. As a plateau, formed in most part of horizontal rocks, its position is remarkable, occupying, as it does, neutral ground in the acute angle between two great regions of special disturbance, the Himalayan on the north, and the mountain system that separates Bengal from the great valley of the Irrawaddi on the south-east.

The western portion of this district is known as the Garo Hills, being inhabited by a half-civilised tribe of that name, of whom little is known, and who are averse to holding intercourse with strangers.\* The eastern boundary of their country is the territory of the Jynteahs, Meekirs, and Nagas.

The Khāsi district may be said to extend, east and west, over one degree of longitude, and in a north and south direction, from the plains of Sylhet to the frontiers of Assam.

The geological section appended to this Paper is taken in a north and south direction, along the Shillong Plateau. At the southern extremity, cretaceous strata rest undisturbed upon metamorphic rocks. This sequence is invariable throughout its entire length, until we approach the borders of Assam, where the metamorphic strata present an unbroken ridge.

At Cherra Poonjee nummulitic rocks repose on the cretaceous, and after a short intervening gap, the result of denudation, continue in an unbroken range to the northward.

The alluvial deposits, which are indicated at the southern end of the section, often attain considerable proportions; and

\* Major Austen contributes a Paper on the Garos, in vol. xlili., *Journal Royal Geographical Society*. London, 1874.

all along the south escarpment there is an extensive series of earthy deposits, probably of deltaic origin.

The range forming the southern edge of the great plateau rises abruptly from the plains of Sylhet, and presents all along its face a remarkably regular outline, but few points overtopping the general ridge, and the uniformity of contour only broken by an occasional glen or deep valley. This southern escarpment attains a height of 8,500 feet, and the highest peaks some 5,000 to 5,400 feet. The slopes, from base to summit, are generally closely wooded, but all forest growth ceases abruptly when the level of the table-land is reached ; the want of protection against the prevailing winds is probably the reason.

Intersecting the plateau are numerous deep, narrow, cañon-like gorges or valleys, along which the streams find their way to the plains below. At Cherra Poonjee the water-course is no less than 8,000 feet below the level of the station. And it would be difficult to find more magnificent instances of the power of disintegration and removal of solid strata that sub-aërial forces may exert under favourable conditions, than is afforded by these deep, sinuous gorges. In outline these valleys closely resemble each other, the upper portion of their sides being composed of horizontal strata of nummulitic and cretaceous rocks, superimposed unconformably upon granite, gneiss, trap, or metamorphic formations.

All along the southern escarpment there are abounding evidences of extensive marine denudation. At one time these bold bluffs or headlands, now jutting on to the Sylhet plains, formed a coast line ; and there are extensive deltaic and estuarine accumulations, though now covered with dense jungle, and scarcely known.

The enormous rainfall of these hills is mentioned in an article on Weather, in *Blackwood's Magazine* for November, 1875, and it is not easy for us, who live in a country the

annual rainfall of which is some thirty or forty *inches*, distributed with some equality over the whole twelve months, to estimate the immensity of the forces that are brought into action when, as it sometimes happens, thirty inches of rain falls in twenty-four hours, and when, during the four or five months of the rainy season, the downfall is said to be fifty feet, = *six hundred inches*!

Dr. Oldham says,\* "I took an opportunity of visiting one of the streams in these hills after a heavy and sudden fall of rain; the water had then risen only about thirteen feet above the level at which it stood a few days previously; the rush was tremendous; huge blocks of rock, measuring some feet across, were rolled along with an awful crashing, almost as easily as pebbles in an ordinary stream. In one night a block of granite, which I calculated to weigh upwards of three hundred and fifty tons, was moved far more than a hundred yards; while the torrent was actually turbid with pebbles of some inches in size, suspended almost like mud in a rushing stream." But rain water exerts its denuding forces, not only on the surface of the plateau, or where, in rushing over the scarps, it excavates deep valleys and basins; it also permeates the upper strata, and hollows out subterranean channels in the nummulitic limestone, and springs from the face of the rocks at different levels, tearing away vast masses, and hurling them into the valleys below. To this solvent action of rain water is to be attributed a singular rounded, "*roche moutonnée*," outline of the surface, such, as Lyell observes, as is characteristic of glacial action.† The disintegration and mechanical removal of the limestone has caused a subsidence of the superincumbent strata of this unusual kind, and it is worth the very careful attention of geologists, being unique, and not mentioned in any

\* *Memoirs Geological Survey of India*, vol. i., p. 174.

† Lyell. *Elements*, 6th Edition, page 140.

geological manual that I have seen as a phenomenon of denudation.

A peculiarity in this section is that the tertiary and cretaceous formations bend down rapidly at its southern extremity. They may have been deposited so on a natural slope, and the beds in question thin out in that direction. This feature is very noticeable in the cretaceous group. The nummulites are so greatly denuded as not to show it distinctly.

The *Nummulitic Formation* plays a far more conspicuous part than any other tertiary group in the building up of the earth's crust, whether in Europe, Asia, or Africa.\* It sometimes attains a thickness of several thousands of feet, and extends from the Alps to the Carpathians, and is in full force in Northern Africa. It was largely quarried in Egypt for the building of the Pyramids, and may be traced thence into Asia Minor, and across Persia by Baghdad to the mouths of the Indus. It occurs not only in Cutch, but in the mountains of Scinde, and Caboul. And it is seen here in fine sections in North-Eastern Bengal, from which it may be traced to the frontiers of China. Nummulites have been found at as much as 16,500 feet above the sea level † in Thibet, and Sir Charles Lyell speaks of their abundance on the flanks of the Pyrenees.

When we reflect upon the fact that nummulitic strata enter into the constitution of the highest parts of the Himalaya Range, and of other mountain chains besides, we are struck with the comparatively modern date to which some of the greatest revolutions in the physical geology of the globe must be referred. The great Himalaya system could have had no existence till after the middle eocene period of geology. During that period the sea prevailed where these

\* Lyell. *Elements*, 6th edition. page 305.

† By Dr. T. Thompson.

chains now rise, for nummulites, and their associated testacea, were unquestionably a marine fauna. A noticeable circumstance in this section is, that it shows the superposition of undoubted nummulites upon strata, the facies of which is cretaceous, and no stratigraphical boundary has, as yet, been detected.

Upon the Paleontology of the nummulitic series, Dr. Stoliczka has given the following note : — “*Operculina canalifera*, D'Arch., and *Nummulites Lamarcki*, D'Arch., are very common ; besides these, fragments of a *Trochocyathus* ; *Stylocania Vicaryi*, Haime ; *Echinolampas sphaeroidalis*, D'Arch., a small *cardita* ; *Pecten* ; *Natica Rouaulti*, D'Arch. ; *Keilostoma marginatum*, Lam. ; a *Ziziphinus* ; the small *Cerithium Hookeri*, D'Arch., casts of large *Natica*, *Cerithium*, *Terebellum*, etc. At Cherra Poonjee,—*Num. Lucasana*, and *N. Ramondi*, *Echinoids*, etc. The earthy Garo limestone is made up of a mass of *N. granulosa*, D'Arch., in various styles of growth.”

*The Cretaceous Series.*—Mr. Medlicott, in reviewing this formation, says—“It would scarcely be possible to make anything like an exact lithologico-stratigraphical scale of the cretaceous deposits around Cherra Poonjee. Small as is the length of the section, and considerable as is the total thickness, there is no character constant in, or to, any one horizon. The series may be said to be sandy throughout ; but the varieties are very numerous, and their distribution is most inconstant. The nature of these deposits, and their unassorted condition, would seem to be owing to the proximity of the area of erosion from which they were derived. The thickness changes from 1,200 feet, at the scarp of the plateau, to 670 feet, under the station of Cherra. At a point ten miles from the scarp, where the nummulitic beds make their last appearance, there is only about 100 feet of cretaceous sandstone.”

As indicated on the section, the surface of the pre-cretaceous rocks is remarkably even, and probably had a similar contour to the present surface.

The difficulty that has been felt in any attempt to assign a definite horizon to the nummulitic and the cretaceous deposits is attributable not only to the general similarity of composition and of arrangement, but to the fact that between the two known fossiliferous rocks in each there is a band of 200 feet in thickness, in which no fossils have been found, save some vague stem-like impressions which might belong to either formation.

The bottom rock of the cretaceous series is a coarse conglomerate, superimposed on several sandstones.

Dr. Stoliczka reports having found in the highest band of the series, *Pelecypoda*, *Cellepora*, and *Astroceraria*; middle series, *Nautili*, *Ammonites*, *Anicoceras indicum*, Forbes; *Anis subcompressum*, Forbes; *Alaria*, *Rostellaria*, *Tritonidea Requieniana*, d'Orb., *Exogyra Matheroniana*, d'Orb., *Inoceramus*, *Rhynconella*, *Pecten*, and many well-known types.

*The Silhet Trap* is extensively shown all along the southern scarp of the Khāsi Hills. Nothing can be said of its age, except that it is certainly pre-cretaceous. It is stratified, and of various composition in different localities. A formation of such great thickness must have had a wide horizontal range; it would seem that we have its northern limit indicated on the section. How far it may stretch away to the south beneath the present delta of the Bay of Bengal, being buried beneath the remains of the newer deposits, we cannot even surmise. It is equally concealed in the east and in the west, in the one direction by the continuous overlapping of cretaceous rocks, and in the other, as far as is known, by similar deposits. The trap appears to have had a northern flow of  $10^{\circ}$  to  $15^{\circ}$ , and its estimated depth here is 300 feet.

Its area may be said to be coextensive with the vast area of disturbance in which it is found, and all the indications observed are in favour of the hypothesis that this area was also one of subsidence.

*The Shillong series* consists of quartzites, slates, and schists. The series has been very little explored. The quartzites are the best known, being conspicuously weathered out in many of the ridges. There still remains to be noticed—

*The Granite*: It contains pale pink orthoclase in large crystals, also oligoclase, and an abundance of hyaline quartz, and mica. In no instance has it been found to penetrate into the sedimentary rocks, or to produce dykes. It disintegrates very rapidly, and for a depth of many feet from the surface is soft and incoherent. Iron, in crystalline forms, is abundant, but is not found in veins. Mr. Medlicott is of opinion that the granite is younger than the trap. The line of greatest elevation caused by the granite, or rather by the forces of which it is the index, had a direction east and west.

This review of the geology of the region leads to the inference that the general basis of the series of formations is granitic, and that each subsequent deposit has been extensively denuded. There would appear to have been a gradual and continuous depression of the surface during the deposition of the entire series, which have subsequently been elevated to their present position. The main line of disturbance is thought by Dr. Oldham to be synchronous with that observed in other parts of Bengal and Central India.

The enormous rainfall of the southern portion of the plateau is accounted for by the sudden resistance offered by

the wall-like escarpment to the rain clouds which pass over the plains of Sylhet, laden with moisture derived from the Bay of Bengal, and which, consequently, at once precipitate their accumulated vapour in deluges of rain. As we travel northwards, the rainfall rapidly decreases in amount.

In the paper by Dr. Oldham, the coal-bearing strata are referred to at considerable length, and he anticipates the time when they will be profitably worked, and when modern civilisation shall penetrate this interesting region.

Such is a brief sketch of the Khāsi people and the territory they inhabit; and both present so many interesting points for study, that it is to be hoped, as attention is more and more directed to them, it will not be long before we receive from other observers additional contributions to our knowledge concerning them.

## ON REPETITION AND REDUPLICATION IN LANGUAGE.

By J. NEWBY HETHERINGTON.

If, as Plato says in his *Theætetus*, wonder is the source of all philosophy, then we need not be surprised that the great problem of human speech has engaged the attention of so many of the wisest of men. From the first dawn of intelligence men have wondered at this marvellous gift, and even amongst the most barbarous tribes legends have been found which attempted to explain its origin. But for long ages men were content with wonder, and the philosophy which it gave rise to was of so vague and uncertain a character that it was but of little practical use. Here, as elsewhere in scientific enquiry, the old deductive system was all-powerful, and men first formed theories and then tried to make the facts agree with those theories; much in the same way, I imagine, as the Frenchman in the story, who, on being told that the facts of a case did not agree with a certain ingenious theory of his, answered, "So much the worse for the facts." But a brighter era has now dawned, students of the science of language, as of every other science, have found that they must master the facts before they build up theories; they must investigate details before they proceed to deductions; they can afford to neglect no detail, however trifling it may seem at first sight; and it is only after years of patient toil, in the valleys and on the plains, that they dare to ascend to the hill-tops, and overlook the whole boundary of their science. Such a survey is granted only to a chosen few, and even to them much remains doubtful. As they speak to us of the origin, growth, and development of

language, the mystery seems almost as mysterious as ever; many perplexing problems remain still unsolved, and the wisest and most learned have to confess that "one question leads to another, until all things end in a mystery."

But whilst these loftier problems are so abstruse, and can be attempted by so few, there are many minor points which are open to any careful student, and which cannot fail to interest all who have ever felt that enquiring wonder which is the parent of all philosophy. It is to one of these minor problems that I wish to call your attention in this Paper, and in doing so I cannot lay claim to any great amount of originality; the facts and instances I shall bring forward have been noticed by others, but have not, I think, been grouped together in the same way. Either a portion only of the subject has been treated of, or the whole matter has been too lightly passed over.

I have long thought that repetition, reduplication, tautology, or cumulation — call it by what name we will — is a most important element in language, and that its importance has not been sufficiently recognised. It has been alluded to by most philologists, and in some instances short treatises have been devoted to the subject, as, for example, *The Glossary of Reduplicated Words in the English Language*, by Mr. Wheatley, published in the *Transactions of the Philological Society*, and a remarkably interesting paper by the Rev. J. Earle, published in *Macmillan's Magazine* for November, 1874. Still, most writers have only taken one class of reduplications or repetitions, and have scarcely as much as suggested a plausible reason for them. I propose to give some examples of repetition, not merely as we recognise it in the form of tautology in writing and speaking, but also as a formative element in language, forming words themselves, and more especially adding to their inflections

and derived forms. I shall endeavour, as far as possible, to draw my examples from the English language, and this for various reasons ; first, as being the most easily understood ; again, because I think that there is scarcely a single philosophical principle which may not be illustrated by it ; and especially because any attempt at illustrating my subject from other languages would far outrun the limits of a single paper.

And here, at the very outset, let me state that I believe that this repetition or reduplication has generally been brought about by a desire for clearness and intelligibility ; a wish to make everything superfluously plain even to the meanest intelligence ; "to make assurance double sure" ; in short, the principle at work is, as I take it, **EMPHASIS**.

By repetition or reduplication, as a formative element in language, I mean any formation wherein the self-same thing is twice said, being repeated either in the same form or with a change of form ; in every case it is a heaping up of forms to express that which is conveyed by each of the accumulated parts, as in such an expression as "most highest," or as in one I have just made use of, viz., "self-same." How universal this tendency is, and how thoroughly it has established itself in various forms of language, will be best seen if we run through the parts of speech, and find it in every one.

In the first place, I wish to bring forward some examples of repetition in inflections. Now, inflections have been called "changes of form to mark changes of meaning," and they mostly consist of suffixes, which apparently are arbitrary and meaningless, but which in reality are the remains of other words,—pronouns, prepositions, auxiliary verbs, and the like. Many modern languages, and especially English, get rid of these inflections to a large extent. At times, however, the old form is retained, though it has lost much of its

significance, and a newer form is added to make the meaning clearer. Thus in old English, *-ster* was a common ending to mark the feminine, and we still retain it with part of its old force in *spinster*. Up to the end of the thirteenth century, *-ster* was a characteristic sign of the feminine gender, and by its means new feminines could be always formed from the masculine, *e. g. baecestre, hearpestre*, and a very curious form, *belleringestre*. In the fourteenth century, we find the suffix *-ster* giving place to the Norman-French *-ess*, and there is consequently a want of uniformity in the employment of this termination. Robert of Brunne, 1325, uses *sangster* as a masculine; and eventually *-ster* came to denote the agent or doer of an action, though a good number of nouns with this suffix are to be found as feminines late in the fifteenth century.

Now when *-ster* was losing its original power, the meaning of the word was emphasised by adding the Romance suffix *-ess*, and such new words were formed as *songstress* and *seamstress*, which are etymologically double feminines.

In the English language we can also find many instances of double or reduplicated plurals; the most noteworthy are *children*, *brethren*, and *kine*. In the oldest English *child* (*cild*) formed its plural by strengthening the base by the letter *r*, and adding *u*, a common plural ending. So in the twelfth century we find *cildru*, which was changed to *childre*, and which still survives in the form common in many northern dialects, *childer*. When this was losing its force as a plural, *en* another plural suffix was added, and thus the modern *children* was formed. The history of *brethren* is similar; first we have *brothru* as the plural of *brother*, then *brethru* and *brethre*, lastly *brethren*. I may note here that Chaucer uses such forms as *daugteren* and *sustren*. *Kine* has been formed in a similar way; the old English *cu* formed a plural *cy*, by vowel change, just as *mus* formed *miu*, and then

we find *kye* and *kyne*. But it is in dialects that we find some of the most curious instances of double plurals ; and this shows that in any linguistic enquiry we can never afford to neglect those out-of-the-way forms of speech which are so rapidly dying out before the literary and cultivated idiom. In some English dialects even the ordinary *s* or *es* of the plural is repeated ; thus a Devonshire man will say *bellowses* for *bellow* ; in Cumberland I have often heard *wayses* for *ways* ; but it is in Sussex that this form is most frequently to be met with ; there we find such words as *posteses*, *beasteses*, *treeeses*, *ghosteses*, and *wristeses*.

Turning to the cases of nouns, we do not find so many instances of repetition as in other forms, still the principle is at work ; wherever the preposition *to* is used with a noun or personal pronoun, as in "I gave it to him," in the place of the old dative case, there is redundancy. Perhaps, however, the most marked instance is in connection with the possessive case, which in part supplies the place of the old genitive in English. We only use the 's of things with life, and in all other instances express the old genitive by means of the preposition *of* followed by the noun. During the last two hundred and fifty years, however, a new form has grown up, and both *of* and the 's are used, *e.g.* "the king's picture" may mean either "a picture of the king," or "a picture of the king's." The latter is in reality a double or cumulative genitive, and, since it expresses a different shade of meaning, is a most useful phrase. Its origin is obscure, and this is not the time to discuss it ; the oldest instance of its use with which I am acquainted is in the authorised version of the Bible, "*How many hired servants of my father's.*"

Now in all these cases the process is the same ; the old inflection partially loses its power, and the same or a similar one is added to emphasise the meaning and make it clearer. Nor is it in gender, number, and case only that repetition is

to be met with in nouns; in words like *upholsterer* and *fruiterer* the formative element is repeated; and there are cases in which, without a repetition of form, there is repetition in the sense; thus in the Bible of 1611, a catcher of fish is called a *fisher*, but this has long been superseded by *fisherman*.

In adjectival forms repetition is to be found, just where we might have expected to find it, namely, in the degrees of comparison, where emphasis is of the greatest importance. The terminations *er* and *est* have gradually given way before the words *more* and *most*, and at one time the two forms were used together. Most students of Shakspere and other Elizabethan writers must have noticed how common double comparatives and superlatives are, such as "*more better*," "*more braver*," "*more elder*," &c. Amongst a very great number, I may instance:

"A more larger list of sceptres."

*Anthony and Cleopatra*, iii. 6. 76.

"The most unkindest cut of all."

*Julius Caesar*, iii. 1. 121.

"To some more fitter place."

*Measure for Measure*, ii. 2. 16.

In the authorised version of the Bible we have "*the lesser light*," *lesser* being a double comparative; and the word "*nearer*" is another instance, for although we use *near* as a positive adjective, it is really an old comparative, *near* or *nyra* being the comparative of *nedh*, the same as our word *nigh*. Shakspere uses *near* as a comparative adverb, "*The near in blood, the nearer bloody*."—*Macbeth*, ii. 3.

But by far the most remarkable instances are to be found in such superlatives as *foremost*, *inmost*, *utmost*, &c. The suffix *-most* is not, as might be supposed, the word *most*, but a double superlative ending. There was an old ending *-ma*, which corresponded to the Latin *-mus* in such words as

*infimus, extimus*, and the old English superlatives were *forma, innema, utema*; but when the ending *-est* became almost universal, it was added to the old superlatives, and so we got such forms as *forma-est, formest, formost, utemest, utmost* or *uttermost*, and many others. Double comparatives and superlatives are not unknown in other languages; they are to be found both in Greek and Latin, though rarely among writers of the classical period; in mediæval Latin they are very numerous, examples are, *postremius, postremissimus, minimissimus*.

But not only are double comparatives and superlatives formed by repetition of the formative element, but in some cases comparison itself is achieved by a simple repetition of the positive. In some languages, the repetition of the simple adjective does duty as a superlative; this is the case to a great extent in Hebrew. The Breton, too, from *madd*, 'good,' has *m  d m  d*, 'best,' from *fall*, 'bad,' *fall fall*, 'worst'; and Shakspere found an expressive superlative in *wonderful wonderful*—“O wonderful, wonderful, and most wonderful wonderful, and yet again wonderful.”—*As You Like It*, act iii., s. 2.

So, again, the French have the term *bon-bon*, translated by English children into *goodie-goodie*.\* This is perfectly intelligible; for as the simple adjective *good* makes a selection out of all that is good, bad, or indifferent, so a second selection may be made out of the category *good*, and thus we arrive, at any rate, at a class *very good*; and by a similar process we may hope to arrive at the highest degree of goodness, that is, the best. Here, as elsewhere, emphasis does its work by repetition.

Occasionally, in English, we find adjectives with a double termination, such as *philosophical, tragical, political*; in such cases, however, the different words often acquire a

\* T. Hewitt Key. *Language, its Growth and Development*, p. 148.

different meaning, as in *politic* and *political*. Sometimes the repetition is more marked, as in such compounds as *four-square* and *self-same*.

Amongst pronouns reduplicated forms are not common, still they are to be found. I think that the use of the so-called emphatic compounds, *myself*, *himself*, is a case in point. In such phrases as *I myself*, *thou thyself*, &c., the pronoun is repeated for the sake of emphasis; and I am told that in Welsh repetition of the personal pronouns is very common. In old English relatal phrases repetition is frequently to be found, and this probably arises from the fact that *who*, *which*, and *what* were originally interrogatives, and, when first used as relatives, had their meaning emphasised by placing the older relative *that* after them. I give some examples:—

“To Venus, whos prest that I am.”

Gower's *Confessio Amantis*.

“Whom that I toke wylh all my pleaunce.”

Hawes.

“The Abbot which that was an holy man.”

Chaucer. *Prioresses Tale*.

“These yatis (gates) which that ye beholde.”

Skelton.

“Spite of his spite, which that in vain

“Doth seek to form my fantasy.”

*Ingelond*, A.D. 1560.

This leads me to notice a somewhat similar construction with the conjunctions *when*, *where*, and *why*. At one time the conjunction *that* was placed after them, just as the relative *that* followed *who* and *which*, and the reason, no doubt, was the same, to mark the fact that they were not used interrogatively; e.g.:

“When that the poor have cried.”

*Julius Caesar*, iii. 2. 96.

" You may imagine him upon Blackheath ;  
Where that his lords desire him to have borne  
His bruised helmet and his bended sword."

*Henry V.*, v. Prologue.

" When that Areite to Thebes comen was."  
Chaucer. *Knight's Tale.*

I now come to a somewhat difficult part of my subject, the part played by repetition or reduplication as a formative element in verbs. In many languages, and notably in Sanskrit, Greek, and Gothic, the perfect tense is formed by reduplication, or doubling of the first syllable of the stem. In Latin this is not so common, though it is to be found in such words as *dedi* and *cucurri*. The only marked example we have in modern English is in *do*, past *did*, though there is little doubt that the vowel change in many strong verbs is owing to a previous reduplication. In old English, the perfect of *do* was *dide*, in old Saxon *deda*, and this clearly shows the origin of the form. Now, if we take it for granted that this doubling of the root, or part of it, formed a perfect tense, without the use of any other formative element, even this goes to support my theory; for surely the expression of an action perfect or completed needs more emphasis than one incomplete and in course of execution.

But many think that the reduplication was not the sole formative element, but that a termination, which has in some cases been altogether lost, or of which only traces remain, gave the meaning of a perfected action or of past time. It would require too much time to discuss this question properly; the whole matter is very ably treated in the 18th chapter of the late Professor Key's work on *Language, its Origin and Development*. Certainly reduplication is by no means confined to perfects. We have in Latin such words as *sisto* and *gignosco*, and in Greek words like διδωμι and τίθημι. In such words, and perhaps in the reduplicated

perfects, the clearer and more impressive conveyance of the idea was probably the sole object.

And now, if we leave the inflected parts of speech, and turn to the uninflected, we still find repetition. Amongst adverbs and adverbial phrases, the use of the double negative is the most remarkable instance. In Greek, we know that three, four, or even a still greater number of negatives may be used in one short sentence ; and so it was in old English. In modern English grammars, we are taught that "two negatives destroy one another, or are equal to an affirmative." But this was not always the case in our language. The change was probably brought about by the Latin scholars of the Renaissance, who thought that whatever was Latinised was right ; and in Latin the double negative never seems to have had a place. This we might have expected from the logical character of the language.

According to the strict rules of Logic, two negatives *are* equivalent to an affirmative, but for all that, in many languages, the instinct of speech and the desire for emphasis proved stronger than the logical faculty, and two or more negatives were used to strengthen the negation. The old English negative was *ne*, placed before the verb, and often coalescing with it, as in the expression, "*Will he, nill he,*" where *nill* = *ne will*. Often, for the sake of emphasis, *na* or *nān* was added after the verb, and so arose such phrases as "*Ic ne was na.*" We have dropped the former and retained the latter.

Previous to the time of Shakspere, the double negative was constantly used in English ; Chaucer piles one on another with great profusion, as in the oft-quoted lines from the description of the Knight in the *Canterbury Tales* :

He nevere yit no vilonye ne sayde,  
In all his lyf unto no manere wight,

which might be paraphrased, "He never did not say nothing wrong to nobody." Shakspere frequently uses the double negative, as in *Much Ado about Nothing*, ii. 1,

"Nor will you not tell me who you are,"

and in the *Merchant of Venice*, i. 2,

"Is it not hard that I cannot choose one nor refuse none."

Had this tendency gone on unchecked, we might at this day have made use of as many negatives as some Greek writers; but now it is only to be met with in some dialects, where, as in so many cases, the old forms of speech survive, and set at defiance the rules of modern grammarians. I have frequently heard in Cumberland such expressions as "I nivver said nowt to nea body." One curious result of this idiom in Elizabethan English was, that even when the verb only implied negation, a redundant negative often followed, as in such a sentence as—

"You may deny that you were not the cause."—*Richard III.*, i. 3.

Here *deny* is equivalent to *say not*, and then the negative *not* is repeated to give emphasis; so in the line—

"First he denied you had in him no right."

*Comedy of Errors*, iv. 2.

Occasionally we find prepositions repeated in old English, as in Chaucer's Prologue—

"And eek in what array that they were inne."

This construction is common in Elizabethan writers, especially when the verb is at some distance from the preposition with which it is connected; *e. g.*

"The scene wherein we play in."—*As You Like It*, ii. 7.

"But on us both did laggish age steal on."—

*All's Well that Ends Well*, i. 2.

"To what form but that he is, should wit, larded with malice, turn him to."—*Troilus and Cressida*, v. 1.

But, besides cases like these, there is repetition, though at times unconscious repetition, when a preposition follows a verb compounded with the same particle, or with one having a similar meaning; thus we speak of "*engraving on wood*," and in America men say now, as our ancestors used to say here in England, that they "*admire at*" something.

Amongst conjunctions redundancy is very frequent; in Greek every one knows how the particles are piled up till they are almost untranslatable; and even in English we are familiar with such forms as "*from thence forth*," and "*for because*." A curious phrase often met with in Shakspere is worthy of note here; it is the form "*or ere*," meaning *before*, as in "*dying or ere they sicken*." (*Macbeth*, iv. 3.) "*Or*" and "*ere*" are really the same words, and are both from the old English "*aer*," *soon*, which still survives in *early*; the comparative was *aerer*, and the superlative *aerest*, which is familiar to us in the form *erst*; the comparative *aerer* was used adverbially, and was contracted into "*or*," and sometimes "*ere*." At first *or* was used alone, as in Ascham's *Scholemaster*, "*or he have construed*," but afterwards, when it was losing its force, "*ere*" was added. It has been conjectured by some that "*ere*" is a corruption of *e'er* and *ever*, but this is hardly likely, since *e'er*, as an abbreviation of *ever*, is rare in Elizabethan English, and the other interpretation gives a clearer meaning in every case. Other instances from Shakspere are:—

"I would

"Have sunk the sea within the earth, or ere  
It should the good ship so have swallowed."

*Tempest*, i. 2.

"I drink the air before me, and return  
Or ere your pulse twice beat."

*Tempest*, v. 1.

A very similar example is afforded by the phrase “*an if*” or “*and if*,” so common in Elizabethan English. *An* or *and*, meaning *if*, was frequently used with the subjunctive, and there has been some controversy as to its origin. The general opinion seems to be that it has nothing in common with the copulative *and*, but is derived from the imperative mood of *annan*, to grant, just as *if* was originally the imperative mood of *gyfan*, to give. Mr. Abbot, however, says (in his *Shakepearian Grammar*) that the two words are identical, and that it was the subjunctive mood following which gave the hypothetical force to “*an*” and “*and*.<sup>1</sup>” But whichever theory be correct, it is certain that “*an*,” with the subjunctive, had the force of “*if*,” as in the following passages :

“They will set an house on fire, an it were but to roast their eggs.”  
Bacon’s *Essays*.

“Alcibiades bade the carter drive over, an he durst.”  
North’s *Plutarch*.

It is this word, and not the copulative *and*, which is meant in the old rhyme :—

“If *ifs* and *ans* were pots and pans,  
There ’d be no trade for tinkers.”

In time, when the subjunctive mood was not so freely used, and when *an* hypothetical, and *and* copulative, were in danger of being confused, *if* was added for the sake of clearness and emphasis, e.g.

“It dies, an if it had a thousand lives.”  
1 *Henry VI.*, v. 4.

“What an if  
His sorrows have so overwhelmed his wits.”  
*Titus Andronicus*, iv. 4.

“An if they live, I hope I need not fear.”  
*Richard III.*, iii. 2.

"Or by pronouncing of some doubtful phrase,

As, 'Well, well, we know,' or, 'We could an if we would' ;

Or, 'If we list to speak'; or, 'There be an if there might.'

*Hamlet*, i. 5.

One more instance of this kind of redundancy; *but*, when used adverbially, generally means *only*, and, in Elizabethan English, we often find both words used, as

"He only lived, but till he was a man."

*Macbeth*, v. 8.

"My lord, your son had only but the corpse."

*2 Henry IV.*, i. 1..

I have now gone through the various parts of speech, and noticed some of the more remarkable instances of repetition and accumulation in each; in those that admit of inflection, repetition of the formative element is, as we have seen, constantly occurring; sometimes, as in verbs, the stem itself or a portion of it is doubled; in the uninflected parts of speech the word itself, or one of similar meaning, is repeated. In every case, as it seems to me, there has been a desire for emphasis and additional clearness. Sometimes, as in the case of the double negative, the double superlative, and even the reduplicated perfect, this scarcely admits of doubt; wherever the same word or syllable is repeated, it must have been done for the sake of emphasis. In other cases, where the same meaning is repeated in another form, this is not quite so clear; the one element had undergone a partial decay, and had lost some of its force before the other was added; still I believe that all the meaning had not passed away from the one when the other was joined to it, and that, therefore, we may account for all by the one main principle of emphasis. For example, *-ster* was still used as a feminine suffix when the new suffix *-ess* was added to form such words as *seamstress*; but there was a consciousness that the fact that the word was feminine needed emphasising.

A very good illustration of a similar process is afforded by many names of places, especially in our own country; different races have succeeded one another in Great Britain, and each has left behind it relics of its language on the map. In many instances these names have been piled one upon another like the rocks in a stratification, and in most cases the same idea is repeated in two or more forms of speech. Take, for instance, the Cotswold Hills; they are so called from the British *coed*, a wood, and the old English *wold* or *weald*, which means the same thing. In Devonshire, near Exeter, Pinho is composed of Keltic *pen*, and English *how*, both meaning a height.\* A very remarkable instance of this sort of repetition is given in Garnett's *Philological Essays*:—“At the head of the Yarrow is a mountain, called of old by the Keltic name, ‘Ben Yair.’ To this the Romans prefixed their ‘*Mount*’ or ‘*Mont*,’ and the Danes afterwards added their ‘*law*.’ The hill is now called ‘Mount Benjerlaw;’ in it *hill* comes three times over.”†

Perhaps, however, *law* may have been an old English word, and *Mount* may not have been added till after the Norman invasion; but in either case the principle is the same. Wansbeck Water is another very good example of the same peculiarity; *wan* is a Keltic element, meaning *water*, as in *Wansford* and *A-von*; *beck* is Scandinavian, and *water* is English. In Cumberland there is a village called Torpenhow, each of the three syllables meaning *hill* or *height*. *Pen-hill*, in Somersetshire, and *Pen-law*, in Dumfriesshire, are analogous compounds. In *Pentlow-hill*, in Essex, we have the Keltic *pen* and Anglian *law*, and the modern English *hill*. The *Ouse-burn*, a stream which runs into the Tyne, presents the English *bourne*, added to a modification of the Keltic *uisge*, water.

\* Rev. J. Earle, in *Macmillan's Magazine*, vol. xxxi., p. 47.

† *Sources of Standard English*. J. I. Kington Oliphant, p. 41.

Hundreds of examples similar to these might be given, but these must suffice. The usual explanation given for such names is, that the repetition was unconscious, that each addition sprang from an independent impression of the natural object in each instance, and that when the new element was added the old one had become totally unintelligible. Perhaps, in some instances, this was the case, but I cannot help thinking that the authors of the new form were frequently more or less aware of the meaning of the old term, and wished to make it clearer; that, for example, when Windermere Lake was first spoken of, men had not entirely forgotten that *mere* meant *lake*. Without making any positive assertion on this point, or claiming these instances as proofs of my theory, I may look upon this notion as, at any rate, probable.

But, besides proper names, there are a great number of words in the English language formed by reduplication. A great number of these are not to be found in the cultivated literary speech of to-day, but must be sought for in dialects and amongst old authors. Mr. Wheatley, in his *Dictionary of Reduplicated Words*,\* gives a list of nearly six hundred, and these probably come far short of the whole number.

Many of these reduplicated words are of an onomatopoetic character, and are purely imitative of the sound or meaning intended to be represented; as, for instance, *murmur*, *cuckoo*, *ding-dong*, *cling-clang*, *rat-tat*, &c.

In Latin, we find such forms as *susurrus* and *tintinnabulum*, both clearly imitative, and in Greek there is  $\beta\alpha\beta\beta\alpha\beta\sigma$ , imitative of stammering or indistinct utterance. Now, although imitation may be said to be the main principle at work in these and similar words, yet we may notice that in many instances the single element is imitative, and the repetition increases and adds force to the resemblance; it,

\* *Transactions of the Philological Society*, 1866.

as it were, calls attention to the fact that the word is markedly imitative.

There are, however, a very great number of reduplicated words which are not imitative at all, and which must be considered separately. Some few, like the imitative *murmur*, repeat the simple element unaltered, but in the majority of cases one portion is slightly varied, the latter part of the compound generally being the primitive element.

Mr. Wheatley divides such words into three classes :—

First. Those in which the body of the word remains the same in both portions, but the initial letter is changed, such as *namby-pamby*, *roley-poley*, *hodge-podge*, *hubble-bubble*, *hurley-burley*.

Second. Those in which the initial letter remains the same, but in which there is an internal vowel change in one portion. These are usually formed by the interchange of *i* with *a* or *o*, as *bibble-babble*, *chit-chat*, *ding-dong*, *sing-song*, *dilly-dally*, *nick-nack*.

Third. This is a very small division, and contains those words in which one or more letters is added to the second portion of the compound for the sake of euphony, as in the Lowland Scotch *argle-bargle*.

There can be no doubt that rhyme or assonance, the pleasant jingle of sounds, has had much to do with the formation of many of these compounds. There is a natural tendency to rhymed sounds, for "we like what is like"; and, even as an addition to poetry, rhyme is older than is generally admitted. But there is something more at work than rhyme in the majority of reduplicated words, and that something is emphasis. I have already stated that in the greater number of such words the second portion is the primary element, and the first part of the word is a mere prefix, used only for the purpose of strengthening or intensifying the meaning. Thus *chit-chat* is from *chat*, *dilly-dally*

from *dally*, *hurdy-gurdy* from *gurdy*, probably a corruption of the Italian name of the instrument, *ghironda*; *shilly-shally* from *shall*, *tittle-tattle* from *tattle*; in all these, and in hundreds of others, the formative principle is the same; thus, instead of saying very weak or *washy*, we say *wishy-washy*, altered from *washy-washy*.

In some instances, the primary element comes first, as in *roley-poley* from *roll*, and *handy-pandy* from *hand*; but these cases are not very common; still the principle is the same, only the intensifying element comes last.

It would be easy to say that such words are childish, vulgar, or the like, and ought not to be admitted as evidence of any linguistic principle; but we must never forget that so-called childish and vulgar, that is, provincial words, often throw the strongest light on many of the most perplexing problems in philology; children, in learning to speak, often unconsciously imitate their far-away ancestors who first elaborated language. If, however, authority were needed for the use of reduplicated words, it need not be sought for long; witness some of the following quotations:

“They heard a noise of many bag-pipes shrill,  
And shrieking *hubbubs* them approaching nere,  
Which all the forest did with horrour fill.”

Spenser's *Faerie Queene*, iii. x. 43.

“An universal *hubbub* wild  
Of stunning sounds and voices all confused,  
Borne through the hollow dark, assaults his ear  
With loudest vehemence.”

Milton's *Paradise Lost*.

“When we have dashed them to the ground,  
Then desie each other; and, *pell-mell*,  
Make work upon ourselves.”

Shakspere. *King John*.

“Confounding, *pell-mell*, her own traditions with God's Word; her own merits with Christ's.”—*Bishop Hall*.

"His wit all *see-saw*, between that and this;  
 Now high, now low, now master up, now miss,  
 And he himself one vile antithesis."

Pope. *Prologue to the Satires.*

"Such continual *zig-zags* in a book,  
 Such drunken reelings have an awkward look."

Cowper. *Conversation.*

"The Paris Exhibition of 1867 is to be the ideal of French skill in their own art of classification. In London, our principle of arrangement was the great *higgledy-piggledy* plan.—*Saturday Review*, June 2, 1866.

If we turn to other languages, we shall find abundant examples of reduplicated words; sometimes the same or a similar word runs through several languages; thus we find *zig-zag* in English, French, and Italian; *zick-zack* in German; *sick-sack* in Swedish; *cig-zaque* in Spanish, and *zyg-zag* in Polish. In French, we find such words as *bric-à-brac*, *ci-ça*, our *see-saw*, and *tric-trac*; in German *fick-facken*, to play tricks, *hokus-pokus*, as in English, *kling-klang* and *misch-masch*. In Dutch, *kikel kakel*, idle chatter, and in Danish *rips-raps*, our *riff-raff*.

Indeed, similar reduplications are to be found almost universally; in Arabic, I believe they may be formed almost to any extent; and they are to be found in Gothic and Sanskrit. But if we wish to see repetition exercising its full force, we must examine lists of words from the languages of savage tribes; for savages are the children of humanity, and their rude and barbarous idioms often tell us more of the secrets of philology than the most polished languages that ever enshrined an immortal literature. "In fact, in the early stages of language," says Professor Hewitt Key, "there seems to have prevailed a general fondness for repetition, but without attaching to it any grammatical idea. The sole object was the clearer, perhaps the more impressive, convey-

ance of the idea. Thus, in South America, we find a river *Bio-bio*, a lake *Titi-caca*, a rodent *Tuco-tuco*. So, too, the New Zealander's vocabulary swarms with substantives, adjectives, and verbs, of such formation as *mati-mati* 'toe,' *emi-emi*, 'tree,' *kiri-kiri*, 'gravel,' *motu-motu*, 'embers,' *ange-ange*, 'then,' *koro-koro*, 'loose,' *áko-áko*, 'to split,' *aki-aki*, 'to urge,' *ati-ati*, 'to drive away.' Our own ears are familiar with such forms as 'talkie-talkie,' and we seem to find them of especial value in our dealings with barbarous nations."<sup>\*</sup> Instances similar to those furnished by Professor Hewitt Key might be found in almost every dialect of the North American Indians; Longfellow's *Hiawatha* would alone furnish many examples; in Australia, we find such names as *ka-rong-ku-rong*, a pelican, *ki-ru-ki-ru*, the king parrot, and *kong-kung*, a frog. In Chinese, reduplications are very common, and they have been adopted in that curious artificial idiom known as "pigeon English." A Hindoo constantly adds meaningless rhymes and repetitions to English words, and will talk of a "button-bitten, kettley-bitley."<sup>†</sup>

Repetition, then, is almost universal, and plays an important part in most languages, both in the formation of words and their inflections; but we may go further than this: not only are syllables and portions of words doubled, but words themselves, and even phrases, are repeated, generally for the sake of additional clearness and emphasis. In phrases like "*bag and baggage*," or "*part and parcel*," we scarcely notice that the second word is really a diminutive of the first, and in "*act and deed*," which, like "*part and parcel*," is a legal phrase, we are not conscious that the two words express very much the same notion. When such repetition is carried to excess, we call it tautology, or redundancy, and try to avoid it both in speaking and writing; undoubtedly the repetition

\* *Language, its Growth and Development.* T. Hewitt Key, page 149.

† Farrar. *Chapters on Language*, page 265. Note.

either of the same word, or of the same idea in different words, is a sign of a faulty style, and offends our modern ears; yet the fear of tautology may be carried too far; and some writers, in order to avoid repeating a word, at times sacrifice clearness to their sense of elegance. In older English, however, redundancy was much more frequent, and, amongst the great prose writers of the Elizabethan and Stuart periods, many examples may be found of the species of repetition which consists in presenting the same idea under slightly varied forms. I give some instances from Hooker:—"It behoveth the very *foundation* and *root*, the highest *wellspring* and *fountain* of them to be discovered;" and again, "That which doth moderate the *force* and *power*, that which doth appoint the *form* and *measure* of working, the same we term a law;" and closely following this passage we have "*Made suitable, fit and correspondent unto their end by some canon, rule, or law.*"

The following sentence, from Tillotson, contains numerous tautologies:—"Particularly as to the affairs of this world, integrity hath many advantages over all the fine and artificial ways of *dissimulation* and *deceit*; it is much the *plainer* and *easier*, much the *safer* and *more secure* way of dealing with the world; it has less of *trouble* and *difficulty*, of *entanglement* and *perplexity*, of *danger* and *hazard* in it. The arts of *deceit* and *cunning* do continually grow weaker, and less *effectual* and *serviceable* to them that use them."

So again in Addison—

"The dawn is overcast; the morning lowers,  
And heavily in clouds brings on the day,"

these three clauses all express the same fact.

In Acts of Parliament and legal documents, synonymous words are joined for the sake of exhaustive completeness; so we get such phrases as "*use and wont*," "*means and*

## 150 ON REPETITION AND REDUPLICATION IN LANGUAGE.

*substance*," and in a Queen's Speech of a few years ago I find the expression, "*to refer back again*."

At times, strong passion or emotion will cause speakers to become tautological, as in Chatham's famous Address, "I am *astonished*, I am *shocked* to hear such principles *confessed*; to hear them *avowed* in this house and in this country." Cicero's exultation over Catiline's discomfiture was expressed by the succession, "*Abiit, excessit, evasit, erupit*."

As a rule, however, modern taste is not in favour of such repetitions; and it is desirable to avoid the multiplication of such tautologies as "*the first aggressor*," "*the standard pattern*," "*some few*," "*the universal opinion of all men*," "*to resume again*," and many other similar phrases.

Sometimes the mere repetition of a word adds very great force to poetical expression. I know of no better example of this than the following lines, where the horror of being alone in the world is told with such force :

"Alone, alone, all, all alone,  
Alone on a wide, wide sea !  
And never a saint took pity on  
My soul in agony."

When a redundant style is purposely employed, we call the figure a pleonasm, and at times, especially in poetry, we can afford to admire such expressions. As a rule, the more primitive a language is, the more it abounds in pleonasms, and some languages seem never to have thrown them aside. The various Semitic tongues are peculiarly rich in pleonastic forms of expression, and we have been familiarised with them through our Bible translation. In Hebrew, people not only speak, but open their mouths and speak; not only answer, but answer and say; do not merely go back, but rise up and return to the place from whence they came forth; and the

widow of Tekoah is not only a widow, but thinks it necessary to tell David that she is "a widow woman, and her husband is dead.\* Again, as an example of repetition in style, take this passage from Exodus xxxii. 15—

"The tables were written on both their sides; on the one side and on the other were they written."

When, in the *Merry Wives of Windsor*, Pistol uses the expression, "He hears with ears," Sir Hugh Evans indignantly exclaims, "The tevil and his tam! What phrase is this, 'He hears with ear'? Why, it is affectations." But, in point of fact, so far from being "affectations," it marks the pictorial redundancy of the earlier stages of language. Such pleonasmus arrive from an instinctive desire to make everything even superfluously clear to the dimmest imagination and the least developed intelligence.

Whilst speaking of redundancy, or syntactical repetition, I may notice a construction which classical grammarians call the cognate accusative, and which in English has been called the objective of kindred meaning. An intransitive verb may take as an object a noun having the same meaning or origin as itself; thus—"to live a life," "to die the death," "to run a race," "to fight the good fight."

In these and many similar instances the idea is repeated, in order to strengthen or emphasise the expression. Everywhere I find the same causes, emphasis and a desire for intelligibility.

I think I have now said sufficient to show that repetition is by no means an unimportant element in language, and should not be passed by unheeded.

This, at any rate, I think I have proved. Whether the theory I have advanced, that emphasis and a desire for clear-

\* Farrar. *Families of Speech*, p. 126.

ness is the main cause of repetition, is, of course, open to question ; still, I may venture to assert that very much may be said in favour of it. When we find inflections repeated, or a new one added to one which is partially losing its force ; when the two halves of a word resemble each other wholly or in part ; when, in the names of places, a new generation has added a syllable or word to one which is no longer readily intelligible ; whenever words and phrases are heaped up in unnecessary profusion ; in short, whenever the same idea is repeated, either in the same form or in varied forms, it seems very clear to me that emphasis and a desire for intelligibility has been the motive power.

But, whether this theory be accepted or challenged, the facts and instances I have brought forward remain unaltered, and must show that in the greater number of languages, and notably in our own, repetition is very prevalent and very important.

I have given many examples, and have had much to say on this subject, yet I cannot but feel how much remains unsaid ; and I conclude, not because I have exhausted my subject, but lest what has been so full of interest to myself should in the end become wearisome to others.

## GLEANINGS IN THE EARLY HISTORY OF LIVERPOOL AND THE NEIGHBOURHOOD.

By JOSEPH BOULT.

CLAIMS for the respect usually conceded to ancient origin and long descent can be so easily advanced, and are so difficult of disproof, that they are usually received with distrust, and are apt to be hastily rejected. If I claim for Liverpool antiquity greater than that usually assigned, I hope to show that the grounds for the claim are good.

It is generally conceded that the earliest mention of Liverpool, in any document now extant, is in a grant from King John, when Earl of Morton, confirming to Henry, the son of Warine de Lancaster, possession of Ravensmeols, Ainsdale, Up Litherland, Liverpool, and French Lea, with eight-pence in the borough of Preston. The date assigned to this document is about 1190; the original grant to Warine's father was by Henry II.

The next historic record is the so-called Charter of King John, who is usually supposed to have acted towards Liverpool the part which Alexander the Great performed for the city he founded in Egypt, except that he withheld the honour of his name; a fortunate escape for the first seaport in the world from the appellation of Johnstown.

The most recent historian of Liverpool\* having declared that "there can be no question that King John was the real founder of the borough and port of Liverpool," I fear it may appear presumptuous to suggest that King John merely adopted the town, having the foresight to discern its eligibility as a base for his schemes of conquest, and for combining

\* *Memorials of Liverpool*, by J. A. Picton, F.S.A. I. 9.

the superintendence of military expeditions with the enjoyment of those feats of venery in which he so much delighted.

I suppose there is not any doubt that Liverpool received its first recorded designation of borough from that king; but it seems to me unquestionable that the terms of the document expressly imply the existence of a town at the time it was issued; and the author above quoted partakes of this view, inasmuch as he says, "The burgages mentioned in the charter were tenements or dwellings, which must have been constructed by the king's order before the charter was granted."

Of the erection of the houses at that time he does not adduce any evidence, though Baines mentions a tradition that the people dispossessed by the formation of Toxteth Park were removed to Liverpool.\*

The important words in the Charter, as translated, are as follows:—"Know ye that we have granted to all who shall take burgages at Liverpool, that they shall have all liberties and free customs in the town of Liverpool, which any free borough on the sea hath in our land. And we command you that, securely and in our peace, you may come there to receive and inhabit our burgages."

The Charter is to all who may be willing to have burgages in Liverpool, and appears merely to concede burgage tenure, which was the equivalent in towns for the socage tenure of agricultural districts, and referred to the mere land upon which dwellings or other erections might be placed.

Shortly before issuing this ordinance, the king had obtained Liverpool in exchange for English Lea, from that Warine de Lancaster whom he had recently confirmed in its possession; and having obtained it, for the reasons suggested

\* *Liverpool*, p. 84.

above, or for others now unknown, he lost no time in improving his property, and making it as productive as possible. Therefore, he constituted Liverpool "a free borough on the sea"; and, important as was this concession, it seems to be the sole privilege or service which he designedly conferred upon it as a town, a "free borough" being one in which fixed and known services or customs were rendered by the holders of burgages.

The date is uncertain at which the local sub-divisions of England were formed, which are now called counties, hundreds, parishes, and towns. It is usual to ascribe the arrangement to King Alfrēd, who, next to King Arthur, is the favourite hero of all those writers of romance which passes for history, but who is so overladen with wise and beneficent ascriptions that he appears almost as mythical as "good King Arthur" himself. It seems to me more probable that most of these local divisions are of much earlier date; but I must abstain on this occasion from adducing the reasons for that opinion, having already done so to some extent in the past session.

I assume, then, that the township of Liverpool, when it passed to King John, like most, if not all other townships, possessed a bohr of some kind; and, looking to the nature of the site, I assume that the bohr was on the crest of the hill, which is now surmounted by the Town Hall, Exchange, and St. George's Church. This conjecture is confirmed by a reference to other places on the neighbouring margin of the sea, such as Everton, Kirkdale, Bootle, Crosby, and others, the original sites of which are all inland, though the sea forms one of the boundaries of their liberties. It obtains additional confirmation from the usual practice of selecting eminences as sites for settlements, less for sanitary than for strategic considerations; a practice so usual as to have led to a confusion between the words bohr and -burg

(a hill), if, indeed, the latter be not a derivative from the former.

Again, as every township possessed its place of assembly, and those places, as far as my observation goes, were always on an eminence, natural or artificial, I apprehend that in Liverpool it was placed on the southern extremity of the peninsular hill, the site which was subsequently occupied by the Castle and St. George's Church: an historic succession very usual, as all will admit, as respects the temples of peace and war, and, I believe, scarcely less usual with respect to the place of assembly, whether it was called the thing, the law, the tor, the moot-hill, or by any other name now deemed synonymous; though I suspect that some of them originally were distinctive of the various functions the different assemblies performed. It is very probable, as I believe it usual, that the place of assembly was constituted the stronghold or keep of the settlement, the dungeon, or boulevard, when wealth took the form of cattle, and so gave those names to the stronghold as well as to the bohr itself.

If the sketch I have already given of the history of the Mersey\* approach correctness, then the waters of the old pool, derived from the uplands on either side, including the moss-lake, meandered to the sea through the wide marsh which lay between Liverpool and Cheshire. As the sea advanced inland, the marsh disappeared, and the base of the site ascribed to Liverpool was washed by the tide; and I hold that it was at this period that the present name originated. The various orthography of that name has occasioned much perplexity, and ingenious attempts to explain its significance, from the eponymous bird called a Liver, through many variations. Whilst I have little doubt that the form of Litherpool is derived from the moss-lake,

\* *The Mersey as known to the Romans.* Proc. Lit. and Phil. Soc., 1872-3.

lither being a derivative from K. *lithe*, viscosity, sluggishness, I have not any doubt that Liverpool is derived from K. *li-feor*, sea-brink, and Lerpole, or Lyrpole, from K. *lear*, the sea, or W. *llyr*, a brink or shore. The form Lidepol, sometimes met with, is apparently K. *li-de-pol*, the pool of the sea.

The arrival of the sea would necessarily produce important changes in the habits of the people. The marsh not improbably afforded pasture, for, in so large an extent, variations of level would almost certainly be found, nay, even eminences of some kind, of which the bluffs on either side are remains.

When the land was replaced by tidal water, cattle would give place to boats and fishing nets. Then, as a consequence, communication with distant places, not alone to the Cheshire shore, but to Wales, Man, Scotland, and Ireland; and communication would lead to trade.

The elder Baines, in his *History of Lancashire* (iii. 524), states that, "In the hundred of Derby, Roger of Poictou stationed four barons: \* \* \* \*. \* \* (of whom) William de Molines, or de Moulines, to whom he afterwards gave the manors of Sefton, Thornton, and Kerden, was appointed Castellan of Liverpool, where the earl had erected the fortress, which, in the records of that age, is sometimes called the Castle of Derby."

It is remarkable that the younger Baines appears to have overlooked this passage, though he enters into an elaborate investigation of the history of the Castle, and says, "According to Camden, the Castle of Liverpool was built by Roger of Poictou. There is no evidence in support of this assertion. The probability is, the Castle occupied (but not built) by Roger of Poictou, was that of West Derby, situate about four miles to the east of Liverpool." He adds, "As I have already mentioned, the Castle of West Derby was of very

great antiquity, and a manor house, also very ancient, was built on its ruins. So late as the year 1790, remains of this manor house still existed near Croxteth Hall, in a mound from twenty to thirty feet high, surrounded by traces of a moat."\*

He also observes: "There is little doubt, however, that the Waltons of Walton, who were the original stewards of the hundred of West Derby, and the first governors of the Castle of Liverpool, were descended from one of the knights who came over with Roger of Poictou; and there is no doubt that the Molyneuxes, who held those offices from the reign of Henry the Sixth, were of equally ancient origin."†

As neither father nor son quotes any authority for his statements, it is impossible to attach much weight to any of them, and so it is allowable to balance the probabilities.

It seems inconceivable that the great earl, Roger Montgomery, should place the chief defence of his southern frontier at Derby, when the more commanding position of Liverpool was available. It is impossible to discern any strategic advantage in the inland position, whilst, on the summit of the bold promontory, almost surrounded with water, any fortress would be easily defended, and assailed with difficulty. As I have already conjectured, this site was selected by the earliest settlers for their bohr, which was alike their homestead and stronghold.

It seems to me also inconceivable that the lords of the soil were oblivious of the topographical and social changes to which I have alluded. The predecessors of King John and of Warine de Lancaster were doubtless duly apprised of the loss of pasture, wherefor their tenants sought diminution or change of service; and when the new course of life was established, and prosperity returned, the exactions of those lords would also return. The younger

\* *Liverpool*, p. 67.

† *U<sup>t</sup> supra*, p. 64.

Baines mentions that King Stephen presented to the Earl of Chester all his estates between the Ribble and the Mersey, and admits that Liverpool was favourably situated for shipping the forces of the De Lacy family, who took a very active part in the early wars of Ireland, and in the time of King John had large possessions in Lancashire, in the immediate vicinity of the port,\* though the port itself had then passed to Warine de Lancaster. The fortifications at West Derby may well have represented some small retreat for those charged with the protection of the king's game, and the maintenance of the obnoxious forest laws, against which there were continual insurrections.

The works constructed by John in Liverpool were probably extensions for the accommodation of forces waiting for a wind, and the strengthening of the outposts, rendered necessary by the increased importance the position had acquired. The younger Baines also admits that there is little doubt the Castle of West Derby mentioned in the Pipe Rolls, or Sheriff's account of 4 John, was the Castle of Liverpool, and a similar mention in 17 John.† On the other hand, he says, “In the year succeeding that in which King John granted the first Charter to Liverpool, he ordered the hundred courts to be removed to Liverpool from West Derby, *where they had been held from before the Norman Conquest.* This appears from the following extract from the Sheriff's account or Pipe Roll of the year 1208 :—‘And in default of West Derby, which is removed to Liverpool, £8.’”‡

The statement in Italics is pure assumption, for which there does not appear to be any foundation ; and the removal of the courts to Liverpool may have been a return to

\* *Ut supra*, p. 75.

† *Ut supra*, p. 78. As, in the first entry, the works were under the inspection of Henry de Waleton, he would appear to have been the Surveyor rather than the Governor.

‡ *Ut supra*, p. 84.

the original domicile. Whilst the new works were in progress, it is very probable that the accommodation for the courts had been destroyed, especially if those works were extensive; and possibly the Peel, or moated residence, at Derby, was used temporarily, with additional guard.

It becomes, then, almost a matter of certainty that Liverpool was a place of importance before it passed into the possession of King John; and, if it were, if it were also a shipping place for military expeditions, it is highly probable that there were entrenchments of some kind, within which the forces assembled, and remained until they embarked. Doubtless, if numerous, a considerable part would be lodged in tents, as when William III. embarked at Hoylake; but a military base of more permanent character than Hoylake would have quarters for the General and his staff, and protection for the shipping place. Thus, then, it is justifiable to suppose that, not only was there a fortification on the site of King John's Castle, but also a fortlet on the beach, probably on the site of the later tower. I find it difficult to believe that any man, even so improvident and short-sighted as King John, would deliberately lay the foundation of a town in such a wilderness as we must suppose the site to have been, if the account usually received is correct; and it seems to me more reasonable to suppose that the king was guided by the experience of several generations, and by the policy of the De Lacy's, and of other astute and powerful leaders. Nay, it is not improbable that, besides his desire to possess a point of departure so convenient to Wales and Ireland, the king may have dreaded the advantage such a position would give to an Earl of Chester, or other local magnate, whose baleful shadow lowered upon the throne. Besides, on what part of the coast, from Milford Haven, northward, was there any place of embarkation available for an English Sovereign? The navigation of the Dee must

ever have been tedious, and often dangerous, especially from North Wales, and the march of levies from the northern counties would be materially shortened by the substitution of Liverpool for Chester, even if the proximity of the latter to Wales, and its subjection to the earls, were not fatal defects.

Mr. Thomas Baines conjectures that Liverpool was one of the six berewicks which are mentioned in *Domesday* as parcel of the manor of West Derby, but are not named; a berewick being, I apprehend, a granary, or dépôt for the bere paid as tribute, tax, or rent, the origin of all the numerous Berwicks throughout the country, the Keltic *fich*, farm, being possibly the root of all the -wicks and -wiches, including the Cheshire-wiches, in which the *salinaria*, or rent for salt, was collected.

The names of Norwich, Northwich, and Northwick are probably variations of one name, to denote a northern district of taxation.

In Archbishop Alfric's *Vocabulary*, ascribed to the tenth century, the word *publicanus* is glossed wic-gerefa; *castra* is glossed fyrd-wic, fyrd being the gloss for *castrum*.

In what is called a semi-Saxon Vocabulary, ascribed to the 12th century, the word *castellum* is glossed wic, *vel* lutel port, all corroborative of the conjecture I have advanced.

It is very improbable that the custodians of the Castle would allow any streets in such close proximity as Brunswick Street or James Street, though at some time there was a tunnel under where the latter was subsequently made, which was no doubt used for those purposes of which it was undesirable the townsfolk should have cognizance. Thus the original fortlet would naturally be placed at the foot of Water Street, or Bancke Street, to give its earlier name, derived, probably, from the Mardyke, or sea bank, which protected the shore; whilst the Chapel of Our Ladye and S. Nicholas was

at the end of the other road leading from the beach, now Chapel Street, and accessible to devout residents unwilling or unable to attend daily prayer in the distant parish church, and a receptacle for those votive offerings which the wanderer on troubled waters had promised to the first altar after land was safely gained. If not deposited in Liverpool, those offerings might be carried to various shrines, as the travellers should wend their way, and so be wholly or partially lost to the Mother Church of Walton.

In those days some protection would be required for the persons charged with collecting the dues on imports and exports, both regal and local, and that protection a fortlet would yield, besides being of service in covering the embarkation or landing of materials of war. When the tunnel under James Street was constructed, its approach from the shore would be protected by the Mersey Island fort, named in accounts of the siege during the Civil Wars, and which I suppose to have stood on Mann Island.

Prior to the accession of the Tudors, the prosperity of Liverpool appears to have depended, in great measure, upon its being the base of the military expeditions against Wales, Scotland, and Ireland; but its prosperity appears to have culminated in the reign of Edward III., declining under his grandson, Richard II., so as to have become traditional under Elizabeth, and justifying the appeal on behalf of her poor decayed town.

Mr. Thomas Baines cites various documents which illustrate the importance of Liverpool as a naval rendezvous and a trading port under Edward III., and to this date, I suppose, is to be referred the institution of the Court of Passage.

When the conquest of Wales was completed, and that of Scotland abandoned, Liverpool would be exposed to the competition of Chester, Milford Haven, and Bristol, on

the south, and of Lancaster and Whitehaven on the north, and to that of all the staple ports elsewhere, and would decline under the blighting influences of peace and monopoly combined. The highest farm of the town, until after the accession of the Tudors, was nearly £600 sterling a year in 1348,\* and so continued to the close of the century; but, by the middle of the following century, in the reign of Henry VI., the farm fell to £260 sterling.†

The ancient remains found near Hoylake appear indicative of the use of that locality as a camp of embarkation prior to the reign of William III. Mr. Ecroyd Smith observes, of the coins found there, that the great bulk of the heterogeneous series appertain to the thirteenth century;‡ and he is supported by Mr. Charles Potter, in a communication to the Historic Society, in December, 1875, on the Geology and Archaeology of the Cheshire Shore. The nature of the relics, combined with the absence of structural remains, appears reconcilable with the existence of successive temporary encampments, but wholly inconsistent with the history of a town or port.

Therefore, it may be inferred that the safe road of Hoylake was adopted by earlier military leaders for the same advantages which led to its selection by William III. and Marshal Schomberg; Liverpool being on each occasion the principal rendezvous.

There cannot be any doubt that whatever trade there was upon the Mersey was in proximity to the tower and chapel, a curious indication that the old pool was more shallow at the time the settlement was founded than it afterwards became, otherwise its shelter would have been sought. The change illustrates that erosion by tidal water to which I have

\* Baines's *Liverpool*, p. 153.

† *Ut supra*, p. 187.

‡ *Ancient Mails*, by the Rev. A. Hume, LL.D., &c., &c., p. 289. It seems probable that the date, 13th century, is a *lapsus penitus* for 14th century.

ascribed the conversion of the ancient marsh and its streams into the arm of the sea, now known as the Mersey. I believe the ferry of Liverpool, as distinguished from that of Birkenhead, was across the pool, nearly on the site of South Castle Street to Park Lane ; some communication of the kind would be requisite before the ford or bridge was constructed at the foot of Lord Street, otherwise pedestrians must have trudged round the upper part of the pool to the foot of Dale Street, thence crossing the Great Heath ; cattle and vehicles tracking the course of the stream off the Mosslake from Dale Street to the bottom of Richmond Row. It is not probable that ordinary tides rose above Dale Street.

It is usually assumed that the word borough is a corruption of burg, which in its turn may or may not be a corruption of borth ; but I have attempted to show \* that borough is derived from K. *borr-rodh*, great road ; and that all boroughs are situated on great lines of communication, which were essentially the king's highway. In such a position, the inhabitants would be subjected to various disadvantages in having to maintain roads with more than ordinary traffic ; in having to accommodate travellers of various degrees ; in the intrusion of vagrants and otherwise ; whilst they would, at the same time, enjoy facilities for traffic with those who came and went in their passage to and fro. Thus the lord and the people would find it for their mutual advantage to commute services into dues, and to agree upon a fixed annual farm. This arrangement appears to have been first adopted in the inland towns, Derby, for example, being one of the oldest boroughs ; whilst the cinque ports did not obtain their special privileges until the reign of King John. But the word ports, as applied to them, is corroborative of the suggestion I have made ; inasmuch as, originally, ports were the

\* *Trans. Hist. Society, Lanc. and Chesh.* 1873-4, *Glimpses of Pre-Roman Civilisation in England.*

entrances into enclosed towns and cities ; and ancient ordinances prescribed that all buying and selling in towns should be in the ports. Boroughs on the sea then became ports, because they were entrances into the country, standing at the end of great roads leading into the interior ; in modern railway parlance, termini of great lines of communication ; and a free borough on the sea resembled a free borough elsewhere, inasmuch as specified dues were exacted. It seems to me rash to suppose that in every case the principle of municipal government was introduced, though doubtless that usually followed. But King John, who created Liverpool a free borough, merely granted burgage tenure to some of the inhabitants ; this is all that is specified. I apprehend, however, that the word *free* implies fixed dues, and that the burgages were of a minimum value. Twenty years later, Henry III. conceded a merchant guild, a hanse, and other liberties and free customs to that guild pertaining, restricting the guild to the burgesses and their friends, and also local courts ; he threw upon the burgesses the burthen of watch and ward, the maintenance of the roads and all other the like burthens, and they were liable to all dues, ingates, and out-gates, both landward and waterward, the court fees, and to compulsory recourse to the town mills. The revenue thus derived was set to farm, sometimes to the burgesses as a whole, more usually to individuals, members of the merchant guild or not, just as it happened. Those who, like the younger Baines, suppose that the burgesses were exempt from the principal manorial and regal rights, both in the boroughs in which they resided, and in all the royal boroughs of the kingdom, appear to overlook the fact that every borough, whether belonging to the king or not, was frequently put to farm ; that free boroughs were founded by some of the king's subjects ; and that all fiscal concession was necessarily limited to manorial assessments, leaving the

borough and its inhabitants under their original liability for military service by sea and land, for aids, tallages, and all other impositions in the discretion of the proper authority, crown, or parliament, and to the prohibition of imports and exports. To say that "It is impossible to conceive a more perfect freedom with regard to trade and commerce than that given by the crown to the burgesses in the royal boroughs,"\* appears to me to display a remarkable confusion of manorial with regal rights. He who held land in socage was still in servitude, only, if it were free socage, he knew the extent of the services he was liable to render. Burgage tenure is the analogue of socage, and did not possess greater exemption. Doubtless, whenever the farm of the borough was in the hands of the corporation, and after the purchase by them of the manor, the burgesses might enjoy that exemption which is still the privilege of the old freemen; just as the lords of manors imposed the whole of the rent or tribute due from their estates upon that portion which they themselves did not occupy; thus making the land retained in their own hands (*i.e.*, their *do-main*) into demesne (K. *de-meas-ne*), that is, inassessable; subsequently the terms domain and demesne became from this circumstance interchangeable. O'Donovan glosses the word *andomain*, which is the negative of domain, as signifying unprofitable land, rocks, moors, and quaws; land which a lord was not likely to convert into his homestead.

The confusion of the words domain and dominion is remarkable; the latter is manifestly derived from the Latin genitive *domini*, but it would be difficult from that to deduce domain, which I refer to K. *do-main*, with which it is identical in spelling and in significance.

The immunity from ingates and outgates which was enjoyed by the people of Prescot and Altcar, I ascribe to the

\* Baines' *Liverpool*, p. 91.

indulgence of their lords, the magnates of Knowsley and Croxteth, when the farm was held by them or their clients respectively. The immunity was challenged by the corporation, but conceded for reasons unrecorded.

The roads from the interior which found their termini in the borough, or great road over the sea, were few and straggling, for most of the leading thoroughfares through the suburbs now in use were formed at the close of the last or in the early part of the present century. This was due to the position of the town amidst bogs, marshes, and moors, by which, especially the former, it was isolated. To this, on a former occasion, I have ascribed the pseudonym of Dicky Sam, as applied to the inhabitants of Liverpool, as signifying the dwellers in the fens, *K. dighe-samadh*. The latter word is apparently the root of the verb to sam, now obsolete, but used by Spenser, in reference to the New Jerusalem :—

“Now are the saints, all in that city *sam*,  
More dear unto their God than younglings to their dam.

*Faery Queen*, canto x. 57.

Here it is clearly applied to those who are drawn or gathered together to dwell in the New Jerusalem.\*

The road to Bankhall and Bootle was by Pillfold Lane, now Vauxhall Road; the northern part of Great Howard Street was not laid out until 1803, Waterloo Road and Regent Road being formed at the same time from the north end of Bath Street.

The great north road led from the chapel and town to Kirkdale, Walton, and places beyond, by Chapel Street, Tithebarn Street, in which was the barn for tithes, Marybone, and Bevington Bush, the latter still rich in the rural

\* In the course of the discussion which followed the reading of the paper, it was stated by Dr. Nevins that the word *sam* is still in use in Yorkshire; and it appears to survive in slang, as when a man treats a party he is said to stand *sam*.

appellations of Gardener's Row, Summer Seat and Gildart's Gardens, as Bevington, like the Cheshire Bebbington, derived its name from cows. Marybone was sometimes known as Scotland Road ; the present Scotland Road is of modern date, and for several years was distinguished by the prefix New.

The road to Everton was through Byrom Street, described by Mr. Picton "as a narrow lane running along the side of the brook," up Richmond Row and Everton Brow, to the fork where Whitfield Lane diverges from Breck Road, but at an earlier period the bed of the brook was probably the road from Dale Street to Richmond Row. The road west of Everton Village, Causeway Lane, was deep and sandy, and, to a recent period, without side walks, so that it is somewhat difficult to understand why it had the name of *Causeway*. The site of Everton Crescent was formerly known as Richmond Meadows, and it is probable that the name of Richmond Row is nearly coeval with the existence of the road by which it is distinguished.

It is not impossible that the Richmond Meadows represent an ancient royal sanctuary, to which those who had incurred the ire of local authorities could fly for refuge ; its position, adjacent to the liberties of the borough, and in a royal manor, is consonant with this conjecture ; whilst the name of Richmond is very like a modification of K. *rig-maighin*, king's *campus* or *locus*. The *maighin digona* was an inviolable place, a place of refuge ; and Dr. O'Donovan suggests that the *maighin* may have been the lawn or enclosed green of a Nemed's residence. Rig-maighin-digona would probably be contracted into rig-maighin, which, with the adventitious -d, often added to words ending in -n, would assume a form and sound not far removed from the present name of Richmond, and closely resembling the surname of Rig-maiden.

Opposite to the meadows were the Causeway-lane Fields

and the Causeway-lane Meadows, to the south of which were the Angel Fields, now covered by the houses and other buildings in Salisbury, Canterbury, and adjacent Streets ; the meadows possibly deriving their name from their vicinity to woodland.

At the fork above mentioned, of Breck Road and Whitfield Lane, were the Burrows Meadows ; and it is noteworthy that a similar bifurcation on the road northwards from Cockermouth, just after it crosses the Derwent, is called the Boroughs ; the coincidence is confirmatory of the suggestion that the word borough is derived from K. *borr-rodh*. Following Breck Road and Whitfield Lane to their junction with Belmont Road, formerly Rocky Lane, we find the fields at the corners were known as Butter-holes. In a paper on *Pre-Roman Civilisation in England*, I have attempted to show that similar names, such as Buttermere, Butterhill, and Butterley, are derived from the proximity of ancient highways. On similar grounds, as well as for other reasons, I regard West Derby Road, on the boundary of the townships of Everton and West Derby, as an ancient highway from the Castle of Liverpool to the Hunting Lodge in Derby ; a field eastward of the Necropolis was called Butterfield. I am indebted to Syers' *Everton* for the names of these fields. In addition to the names quoted, the arable lands in Everton appear to have been grouped into three fields : (1) The Netherfield, which lay between Netherfield Road (north and south) and the Borough of Liverpool, and between Kirkdale and Everton Brow and the Richmond Meadows ; (2) The Houghfield, Hongfield, or Hangfield, bounded by Sleeper's Hill, Beacon Lane, Breckfield Road North, Breck Road, and Oakfield Road ; the correct form of the name appears to me to be Houghfield, from its position nearly on the top of the hill ; and (3) the Whitefield or Whitfield, which lay between Everton Road and Boundary

Lane, and between Whitfield Lane and the West Derby Road ; the Lord's Mill appears to have stood in this locality, four fields bearing the name of Mill Hey, and the name may have been derived from the corn grown on the land. The remainder of the township included the brecks or sheep pasture, and the waste with moor and moss. Traces of a stream appear in the river Hey and the river Slack. I think the line of an ancient cross road will be found in Everton Road, leading southward to Lowhill, doubtless a former Lawhill ; for, as I have endeavoured to show in the essay last named, the various lows or laws represent some of the numerous places of assembly, required for bohirs, or manors, hundreds, and counties. It is difficult to specify the court to which the different designations applied, and it is even doubtful if the names were specific ; but the Lows in this neighbourhood appear to be numerous, as in Spellow, Walton ; Dudlow, Wavertree ; Blacklow, Huyton ; and the Lowhill at Edgehill, which appears to have been named the Brownlow, in distinction from the Blacklow.\* The latter, that is the Blacklow, or Wheathill, (*wit*, for tax), is one of the sources of the Torbeck, a feeder of Ditton Brook, the name of which has been corrupted into Tarbuck, as applied to the township of which it forms one of the boundaries, sometimes spelt Torbock. Spellow may be from K. *speil*, cattle, a medium in which tribute was frequently paid ; and Dudlow from K. *did*, a pap or dug, analogues to which are found in the name of Papcastle, Cumberland ; the Mam Tor, Derbyshire ; and Moel Fama, Denbighshire, all doubtless referring to the milking of the taxpayers. Another Low

\* Sandown, Wavertree, may be referable to K. *sand-dun*, the ancient fortified house or hill ; that it was formerly a place of some importance is apparent from the burial-place, containing six ossuaries, which was discovered in the neighbourhood on the site of Urn Mount, Victoria Park. It was described by Mr. H. Ecroyd Smith, in a communication to the Historic Society, 1868, contained in the Transactions for that session.

appears at Greenbank, bearing the name of St. An Low, on Lord Sefton's map of Toxteth, *circa* 1754, which may be a corruption of K. *an lagh*, the law, or great law, and allied to the names of Anfield, which apparently is to be found in every part of the country. It is possible the prefix *an-* may represent K. *aighne*, an advocate or pleader, whose assistance may have been allowed in the ancient courts, as at a later period in those of Wales; or the prefix may represent K. *ainn*, a great circle, the form an open-air assembly was likely to assume. It appears to me certain that the neighbourhood of Greenbank has been the scene of important events. The escarpment by the brook in Sefton Park, at the north end of the viaduct, is manifestly the work of man, and I am disappointed no relics to confirm this appearance have been discovered during the works which have been carried on there. The names of Broomegge and of the park of Magewom, which appear as part of the boundary of Toxteth, seem to be a record of violence. Broom, as I have attempted to show, as respects the occurrence of the name in Westmoreland, represents Brovacam, the settlement at the junction of roads; such a junction is found in the site assigned to the hamlet of Smithdown, or Smitham, at the corner of Penny Lane and Smithdown Road; the termination -egge I refer to K. *ag*, battle; and I conjecture that Broom was of more importance than the hamlet by which it was succeeded. The name of Magewom is probably A.S. *mægen-wom*, denoting a great crime; and probably a floating traditional record rendered concrete. The names of Penny Lane and Penketh bear testimony to conflict, K. *pinn-nidh*, *pinn-keit*, both signifying battle-hill. The names of Penketh and Penny are of frequent occurrence on the ordnance survey. In this neighbourhood, at the junction of Penny Lane and Smithdown Road, are two fields, which, on Lord Sefton's map, *circa* 1754, bear the name of Higher Smetham

Hey, and Smetham Croft, which are derived from the hamlet a certain poor man, Robert de Smethdun, son of Thurstan, was obliged to surrender to King John, in exchange for Thingwall, the site of another local court; and it seems probable those fields are the site of the cottages, or rather hovels, of the hamlet; on Burdett's map they appear to be unenclosed. A curious memorial of Smithdown apparently survives in the modicum of tithe levied in Toxteth. As a royal park the original township would be exempt from ecclesiastical impost, but the hamlet of Smithdown would not enjoy the privilege; and I conjecture that the amount due from Smithdown was paid by the officers of the park, and as the boundaries of the hamlet were destroyed, the original appropriation could not be restored after disafforestation.

Smithdown Road is unquestionably an ancient way, apparently connecting Liverpool with Warrington, through Garston and Hale, and also with the Calder stones, whatever their unknown purpose may have been. In the name of Mosley Hill is a survival of the ancient name *slidh*, or *slighead*, denoting the largest of the ancient highways, so broad that the chariots of a king and a bishop could pass each other. In my opinion, it forms the terminal of the names of many places, such as Knowsley, in *Domesday* *Che-nulveslei*, that is, the road at the head of the great wood; and as Bosley, Bordesley, Broseley, and Mawdesley; Mosley denoting the great chief highway, either a pleonasm or indicative of special importance, from leading to the seat of government. Smithdown Road appears to have entered Liverpool by Brownlow Hill, and formed part of the boundary between Toxteth and West Derby. The name of Sinthedun was sometimes used in place of Smithdown; and abandoning all Teutonic etymology, which in the names of places is usually fallacious, the signification of the words is not very dissimilar,

If treated as Keltic, Smithdown appears to me to refer to the Mosslake, and to represent *eas-midhe-dun*, signifying the water-hill boundary ; and Sinthedun, *sin-ta-dun*, round-hill-edge, both having reference to Edgehill, at the base of which the Mosslake and a considerable part of the road lay. Until the close of the last century, Mount Vernon Green, with the site of Edgehill Church, and the houses between the Green and Irvine Street, were all open space, are so represented by Burdett, and, I conjecture, occupy the position of the Law. The line of another ancient road appears to survive in Edge Lane, Broad Green Road, and on by Roby (the road-place) to Warrington. For reasons given in the essay on *Pre-Roman Civilisation*, the name Broad indicates the proximity of a great road ; certainly there is no indication of any *broad* green on the line of road ; it is not at all improbable that the principal roads would be from one hill of assembly to another, when there was no longer any necessity for that isolation which, I believe, governed their original selection. Each in its degree was a centre of civilisation, and round it gathered the hamlet or the town, the keep and the church. The road last sketched would connect Thingwall with the Brownlow ; Smithdown Lane, Anlow, with the Brownlow and the assembly in Liverpool ; the line of Everton Road, Anlow, and Brownlow with Spellow, passing the Beacon ; and the road connecting Smithdown Road with the Calder stones would also give access to the Dudlow. Sleeper's Hill, Everton, probably represents *slidh-bre*, the road brow, or head.

In a note upon the significance of the name of Toxteth, Mr. Picton has referred to a suggestion offered by me in a communication to the Architectural and Archaeological Society, in 1867.\* Mr. Picton asserts that A.S. *stoc* is never used for growing timber, and that its primary meaning is a log of

\* *The Former and Recent Topography of Toxteth Park.*

wood.\* On referring to Bosworth's A.S. *Dictionary*, I find he renders *stoc* by a stock, stem, trunk, block, stick; there is not any mention whatever of a log of wood. In *Promptorium Parvulorum* *stokke* is glossed *truncus, stipes*, the latter doubtless a misprint for *stirpes*; in the volume of *Vocabularies*, compiled by Mr. Thomas Wright, and published at the expense of Mr. Mayer, are examples in Archbishop Alfric's *Vocabulary*, and others, of *truncus* being rendered *stoc*. If I turn to Keltic, *stoc* is rendered a stock, pillar, post; also a root, bulb, stem. In the present day, Webster explains stock as the stem or main body of a tree or other plant; the fixed, strong, firm part; the origin and support of the branches; as the stem in which a graft is inserted, and which is its support; as a post, something fixed, solid, and senseless. The flowering plant called a stock, I apprehend, derives its name from the numerous stocks it produces, which, when layered, grow into separate plants. I may remind you that the so-called submarine forest in Cheshire is sometimes called Meols Stocks; a name which has suggested the idea that some of the stocks there have been derived from Stocksteth. Several similar stocks, I understand, have been found in excavations in both Prince's and Sefton Parks. Not that the trees were necessarily cut down by the hand of man, but possibly, as suggested by Mr. Charles Potter, and as sometimes witnessed in the present day in Canada, broken short off by the wind during severe frost. Having regard, however, to the names about Greenbank, I am disposed to think that it is, on the whole, most probable that the Romans penetrated thus far from their outpost near Warrington, marching through the open meadows and marsh land which border the Mersey, making the top of Mosley Hill their vantage ground, and thence descending with resistless force upon the encampment

\* *Memorials of Liverpool*, ii. 527.

below. They may have also penetrated to the secret temple—*ceal-deir*—and reduced it to the few Calder stones which still record its existence. By any other route, their march would have been embarrassed by the great forest of West Derby. In summer the marsh would be dry and firm, and an easy access; and it may be assumed that the Romans must have made their power felt a few miles from their stations. The appearance the stems and butts now present may be due to the weather, to submergence, and the incidents of transit.

Mr. Picton also observes, “Mr. Boult has confounded the suffix *stede*, a clearing, a station, with *staeth* (modern English *staith*), a landing-place, which is an entirely different word.” So far from being entirely different, I believe the words are orthographical variations from the same root. Bosworth confirms this, for he renders *staeth* as not only a shore or bank, but also as a station, a place; and *stede* as place, or station; while the adjectives *staethig* and *stedig* signify steady and firm. Both forms, I apprehend, are from K. *staid*, state, or condition, and allied to *staidheir*, a step or stair. In the *Vocabularies* before referred to, the word *steth* is glossed *ripa*. The editor, Mr. Wright, in a note, p. 54, observes, it is the more modern *stade* or *staith*, which is still used in some parts of the country in the signification of a bank of a river, or, in some places, of a wharf or quay. In *Prompt. Parvu*, the word *stathe* is rendered *waterys syde*, glossed *stacio*, from the *Catholicon*. In a note, Professor Way, the editor, gives different forms of the word in various early copies, and says, at Lynn are quays called “common staiths, “king’s staith,” etc.; that the name occurs frequently in Norfolk, and he refers it to A.S. *staeth*, *littus*. A word so diffused as to be found on the Tyne, in Norfolk, and the western counties, is not unlikely to be found in Lancashire.

The origin of the application of the word and its derivatives to landing-places and steadings appears to be due to the special appointment or appropriation of places so-called to those purposes. For example, in the ordinance respecting the Dun-setas,\* it is enacted that neither a Welshman shall travel in English land, nor English in Welsh, without the appointed man of the country, who shall receive him at the staeth, and bring him thither again without guile.

Clearly, in this ordinance, the staeth was a frontier station; if the frontier was a deep river, the staeth would be a landing-place, but otherwise it would be a stead, or station. It is quite consistent with the information attainable as to the laws for the government of travellers, that there should be landing-places and other stations at which rivers, streams, marshes, bogs, forests, and hills, should be crossed. If a man came from afar, or a stranger go out of the highway, and then neither shout nor blow a horn, he was to be counted a thief, either to be slain or to be redeemed. Now, it appears to me that in Toxteth was a place appointed for wayfarers who wished to cross the marshland between Cheshire and Lancashire, and it may have become a landing-place, as the encroachment of the sea rendered boats or coracles indispensable. But I must refer those who desire to learn the exact position of the staeth to King John, or to the tidal wave; both have been destructive in the township, and whilst the tide is probably guilty, the responsibility may rest with the king.

The possessions held in Lancashire by the Knights Hospitallers, or Knights of S. John of Jerusalem, appear to have been very limited. Of one there are still traces in Woolton, K. *ul-fith-taun*, the great wood town. It is described as Camera de Wolneton, in comitatu Lancastrie. Sunt ibidem unum messiagium, l. acre terre, v. acre prati, j.

\* *Ancient Laws and Institutes, England.*

molendinum aquaticum (perhaps in Torbeck), et viij. li.  
sunt redditus, et dimittuntur ad firmam, pro xx. marcis,  
Summa valoris—§ summa patet xx. marce.

The other possession is described as Camera Sancti  
Salvatoris, vocata Le Stede, in eodem comitatu. Et  
dimititur ad firmam, de anno in annum, reddendo inde  
ad Thesaurium de Clerkenwell, ultra cantarium unius  
capellani quam inveniet sumptibus suis propriis x. marcas.  
Summa valoris—§ summa patet x. marce.\*

I have somewhere read, but have mislaid the note, that  
the Knights had fish-stews in Toxteth; and it appears  
probable that the Camera Sancti Salvatoris was in Toxteth  
and at Greenbank. I am not aware of any stead or staeth  
which can offer better claims; nor, considering the purpose  
to which Toxteth was applied at the date of the Report  
quoted above, A.D. 1338, and the scarcity of fresh water, is  
there any other situation so likely for the stews; and to this  
neighbourhood, in the vicinity of the escarpment before  
mentioned, I am now disposed to place that waterfall above  
the wood which I believe gave its name to Oscelesbrook, the  
southern boundary of Toxteth, in conjunction with Otirpool,  
more recently known as Otterspool, just as the brook was  
often termed the Jordan.

Perhaps the jealousy of the Templars was one reason  
why the monks of Stanlaw preferred Whalley to Toxteth.

The only other staeth near Liverpool is Croxteth, well  
known as the modern seat of the Molyneuxes of Sefton.  
Here the station seems to have been on the Alt, and the  
name appropriately refers to the narrowness of the stream, if  
*K. croch-staid*, the short station or ferry. O'Donovan gives  
*bo-chroc*, from Cormac's *Glossary*, as signifying a cow with  
short horns. If, however, the prefix represents *K. crioch*,

\* Camden Society. *The Knights Hospitallers in England*, A.D. 1888. Printed  
1857, p. 111.

a boundary, a barrier, we have an illustration of the difficulty arising from deficient historical information, as it is impossible to assign the district or territory of which the Alt was the boundary or limit.

In the essay on Toxteth Park, before referred to, I entered into a careful examination of its boundaries, as described in the *Testa de Neville*, and in the *Coucher Book* of Whalley Abbey. Mr. Picton has gone over the same survey; and, though he does not distinctly refer to my essay, it is difficult to believe that he was not combating the views I expressed. As I understand his conclusions, Mr. Picton supposes that Toxteth formerly extended as far north as Downe Street, near Richmond Row; or, to quote his own words:—" *Prima facie*, then, there is evidence that the limits of Toxteth in the thirteenth century, along the seaboard, lay within the two *embouchures* of Liverpool and Otterspool." And again, "I cannot see any escape from the conclusion that, at the time of the perambulation and report, in 1228, the portion of Liverpool south of the pool was included in the manors of Toxteth and Smethedon."\*

It is wonderful that the ghost of the compiler of the *Moore Rental* has abstained from visiting his wrath upon one who so fully justifies the Molyneux claim that Liverpool heath was all his, and concedes him more to boot. I wish Mr. Picton had proceeded a little further, and explained when, how, and why the Molyneux family, or any one else, had permitted the bounds of Liverpool to be extended to Parliament Street.

The description in the *Coucher Book* may be translated as follows:—" By these bounds, that is to say, where Oskelesbrook falls into the Mersey, following Oskelesbrook in ascending to the park of Magewom, and from the park to Brounegge, following from Brounegge to Brymeclough,

\* *Memorials*, ii., 580, 582.

and thence across to the ancient turbaries between the two meres to Lambesthorn, and from Lambesthorn in descending to the Waterfall at the head of Oterpool, following Oterpool in descending into the Mersey."

Mr. Picton notices the peculiarity in this description which arises from the substitution of Oterpool for the Stirpool of *Testa de Neville*, but will not accept my suggestion that the mouth of Oskelesbrook was known then as Oterpool, as subsequently by its present name of Otterspool, and that the clerk had substituted Oterpool for Stirpool, writing O for S. In confirmation of my suggestion, as to Oterpool being the mouth of Oskelesbrook, I refer to Mr. Thomas Baines' statement, that in an Inquisition of the forests of West Derbyshire, 16 and 17 Edw. III., it is recorded that the brook of Otterspool turned a corn-mill, which was called the Mill of Atters,\* a name not very dissimilar from the present name of Otters-, or the earlier name of Oter-.

Of Stirpool, Mr. Picton observes:—"Between the outfall of Otterspool on the south, and the old pool of Liverpool on the north, there has never existed any watercourse which would at all answer the description in the text."† The only description I find in the text is that of a stream called Stirpool, with a waterfall at its head, which, I apprehend, may apply to a very small stream over steep and broken ground, such as may have fed Mather's dam and the water-mill there, and then have descended rapidly to the Mersey. Any one who has noticed, after heavy thunderstorms, the channels of the steep streets near the south docks, will be able to realise the appropriateness of the name Stirpool to all those narrow streams.

In the beginning of the present century, Parliament Street was laid down on a give-and-take line between Toxteth

and Liverpool, a line which agrees very closely with the boundary as laid down on Burdett's map, and, in my judgment, with the bounds recorded in the *Coucher Book* and *Testa de Neville*, and with Moore's complaints against the aggression of the Molyneuxes and their tenants. The two meres appear to me to have been the old moss-lake on the site of Abercrombie Square and neighbourhood, and a mere in what are called the Parliament Fields, on the line of the continuation of Sandon Street, where a low embankment is now being formed to carry a new road. In the essay on Toxteth Park, I conjectured Lamb's Thorn to have stood near the junction of the Prince's Road with Parliament Street.

In the elder Baines' version of the description from *Testa de Neville*, the expression, "Up to Lambisthorn," is used; and from Grove Street there is a slight ascent in Parliament Street, which very probably was greater before the street was laid out and graded.

Mr. Thomas Baines quotes two documents which appear to refer to this matter; the first is a grant from Earl Thomas of Lancaster, in 1309, 3 Edw. II.:—"Know all men, etc., to our burgesses of our town of Lyverpole, six acres of moss (each equal to nearly two statute acres), lying between the Pikecroft lands and the Lambthorn, adjoining the goit of the said town of Lyverpolle, to hold and to have from us and our heirs, freely for ever, pay yearly to us and our heirs a silver penny," etc.\*

The second document is a return of the bailiffs of the second earl Henry, made two years afterwards, which explains that the bailiffs of Liverpool answer for one penny of rent for twelve acres of turbary, on the moss, in exchange for a piece of ground enclosed within the park, by charter of Thomas, late earl.†

\* *Ut supra*, 127.

† *Idem*, 158.

Doubtless, the Lambthorn of Earl Thomas's Charter is the Lamb's Thorn before mentioned, but the site of the Pikecroft lands is at present unknown, so the balance of probability must be tested by each person for himself.

The stone plate referred to by Moore, in the *Rental*, was probably a large square flag laid over the water-course, where crossed by the highway, for the convenience of man and beast, a rude bridge, in fact, not a sluice.

Before concluding, I wish to refer to the little hamlet of Newsham, in the township of Walton, and comprised within the grounds of Newsham House, to which the Yellow House estate was added to form the present Newsham Park.

There is no doubt that the prefix New- in the names of places often indicates that those names were bestowed at a comparatively recent date, especially when the root name is also retained in the neighbourhood with the prefix Old-. But I have long considered such an epithet as in some cases very apocryphal, and have been doubtful if another significance was not intended.

There are, for example, an indefinite number of Newtons, Newbolds, Newbies, Newshams, Newbiggins, Newhalls, Newsteads and Newchurches, besides Newcastle, scattered over Great Britain and Ireland. Taking Newcastle for illustration, the postfix -castle appears to be from K. *caisdeal*, or *caisteal*, glossed a castle, a stronghold, and allied to the Latin *castellum*. But it has been suggested that *caisteal* is itself a derivative from *caiseal*, cashel, a rock or stone, on which tribute was paid, that is, *ail-cise*, equivalent to *ro-cise*. The prefix New- in such connection is probably Keltic also, that is, from *nua*, strong, rather than from the same word in the sense of new.

There can be little doubt that some of the earliest Newcastle were strong positions, at which tribute was collected,

and therefore strong. Some are likely to be successors of earlier fortifications. So Newton-in-the-Willows, or -in-Makerfield, was formerly a position of strength on the ancient road through Warrington and Wigan. The site ascribed to the Castle appears good for the strategy of that day; and it is to be noted that in the neighbourhood are several pieces of land bearing the name of Chesterfield, which has a military sound.

The word *samadh* (*samay*) appears to have been applied to gatherings or collections of people, as the clergy and monks of any ecclesiastical establishment, the family of a monastery, a congregation, and a family.

Newsham, then, may have been either a place of assembly capable of good defence, or a strong rallying point, round which the able-bodied men of the district gathered together on the first alarm, perhaps placing their households and valuables in the centre. Here, as in numerous other cases, conjecture lacks the aid which the light of history gives to penetrate the palpable obscure.

## SALT, AND ITS EXPORT FROM THE PORTS OF THE MERSEY.

By THOMAS WARD.

The manufactured or white salt of Cheshire, as distinguished from the rock salt or natural mineral salt, is made from brine or salt water. This brine is found upon the top of the first of the two beds of rock salt, at a depth of about forty yards from the surface, more or less according to the locality. The fresh water percolating through the overlying beds of sand and marl, reaches the rock salt, and, dissolving it, forms brine, which, when it is fully saturated, contains about 27 per cent. of salt. The Cheshire brines usually contain about 25 per cent. The method of obtaining the brine is by sinking a shaft or well, which is made water-tight, to prevent the fresh water getting in and weakening the brine. A steam engine is employed to pump up the brine, which is usually conveyed through pipes to large cisterns or reservoirs, and thence to the works, to supply the pans in which the salt is made. In some districts the brine upon the "rock head," or the surface of the upper bed of rock salt, having either been exhausted or become too weak to be worth manufacturing, some of the "worked out" mines\* in the lower bed of rock salt have been utilised as reservoirs, the brine and fresh water lying in the neighbourhood having been allowed to run in.

In the manufacture of salt from brine, the object is simply to regain the salt that has been taken up by the water. In a fully saturated brine there is what may be called a state of

\* For a description of these mines, and also of the beds of rock salt, see my Paper, "The Cheshire Salt District," in the Society's proceedings for 1872-3, pp. 39-68.

equilibrium. Before any salt can be made the brine must become fully saturated, and this state of equilibrium be produced. If we take away a portion of the water the equilibrium is destroyed, and a portion of salt is deposited sufficient to restore the balance. The whole principle of salt making, whether carried on along the sea shores or in our salt works, is one of abstracting the water and causing the salt to form. The moment a particle of water is withdrawn, the salt commences to form crystals, generally at the surface. When a low degree of heat is used, and the surface of the brine is not much warmer than the air, crystals form at the bottom and on the sides of the salt pan, and also on any strings or thorns placed in the brine.

There are various methods of driving off the water. In warm and dry climates most of the salt is made from sea water by the heat of the sun, and is called solar salt. It is generally coarse in the grain. Where the brine contains an excess of water, and where fuel is dear, the water is evaporated by exposing as great a surface as possible to the sun and wind, as, for instance, in letting the brine trickle through large heaps or walls of thorns, or down cords tightly stretched, or over and down a series of steps. In Cheshire we cannot rely upon sufficient solar heat or drying winds to evaporate the water, so are obliged to resort to artificial fuel. In making solar salt, and salt from natural brine springs, the whole of the water is never driven off. There are reasons for this arising out of the manufacture.

The brine is allowed to run into large wrought iron pans, usually varying from 30 to 60 feet in length, and about 24 feet in width, having a depth of from 18 to 24 inches. These pans are set over large fires, having flues running under the pan. There are various schemes for arranging these flues, but the object is the same, that of utilising the heat and consuming as perfectly as possible the fuel. The length of

the pan is decided by the kind of salt to be manufactured. If a fine grained salt is required, the pan is short; say from 30 to 35 feet long. If a coarse grained salt, the length varies very much, though it is usually about 60 feet. The width is mainly determined by the facility of working, and about 24 feet is found wide enough for a man to reach to the middle to rake out the salt. The dimensions have been arrived at entirely by the results of practical work.

The brine is clarified by means of some gelatinous material, as glue, calves' feet broth, and such like. This is added to the brine when the pan is filled, and as the pan gets hot, a scum rises to the top, and is taken off. We will consider now that the brine is in the pan and the fires lighted. How are we to produce the various kinds of salt, from the very fine grained table salt to the coarse bay salt? In a few words the whole thing may be explained. The finer the salt, the greater the heat and the less time in the pan. The coarser the salt, the less the heat and the longer time in the pan.

In making the finer kinds of salt it is requisite that the brine should boil. This necessitates a short pan, for in a long one it would not be possible to keep the whole pan boiling. The waste heat is utilised by carrying the flues under a room, called a stove, at the back of the pan, into which the fine salt, having been taken out of the pan into moulds, is placed to become thoroughly dry.

As soon as the brine has parted with its surplus water, the salt begins to form on the top, and soon sinks to the bottom. The constant ebullition of the boiling brine prevents the salt crystal from forming properly, and breaks it up. Thus boiling pans produce fine, irregular, broken grains of salt. The pan soon becomes sufficiently full of salt to require "drawing," as it is called, and this process takes place twice daily. The salts known by the names of butter salt and stoved salt are made in this way.

When the heat is kept below the boiling point, but approximating to it, a coarser grained salt is made. The grain forms in small flakes at the top, and sinks to the bottom, where, being allowed to remain for about a couple of days, it grows and becomes fairly solid. This kind of salt is the most commonly made, and, being the cheapest in manufacture, is used for many purposes, and is known in the trade as *common salt*. The pan in which it is made is generally about 60 feet long.

The coarser salts, known as fishery and bay salts, require a less degree of heat still, and remain in the pan from five days to a month, and sometimes in pans heated by exhaust steam as much as two or three months. The grain of the salt becomes solid and hard, and increases much in size. Cubes of an inch on the side are occasionally produced.

The samples of the various kinds of salt lying before you will serve to illustrate what I have already said, and it will be useful to keep them in mind during the remainder of the Paper. I have classed them as follows—

*Boiled Salts*.—Stoved Salts.

Butter Salt (unstoved.)

*Coarse Salts*—Common, }  
Fishery, } All unstoved.  
Bay,

The quantity of fuel used in the manufacture of salt by the ordinary process varies from about 10 cwts. to 18 cwts. per ton of salt made, the boiled salts requiring the greater quantity of fuel.

Cheshire salt is sent to all parts of the world, chiefly through the ports of the Mersey. These are Liverpool, including Birkenhead and Garston, Runcorn and Weston Point. The situation of Liverpool and its great advantages are too well known to need any description. Runcorn is upon the Upper Mersey, at the entrance of the famous

Bridgewater Canal. It owes its existence as a port to the Trustees of the Duke of Bridgewater. The docks are now owned by the Bridgewater Navigation Company, Limited. The Bridgewater Canal is connected with the Grand Trunk Canal, which passes through the salt districts into Staffordshire. Large quantities of salt are sent by this route to Runcorn. By means of a short canal, Runcorn is connected with the river Weaver, and thus receives a quantity of salt.

Weston Point is a small port, situated about a mile to the westward of Runcorn. It is at the mouth of the Weston Canal, which connects the navigable portion of the river Weaver with the Mersey. The mouth of the Weaver lies near to Frodsham, but the lower course of the river not being well suited to navigation, the Weston Canal was made early in the present century. Nearly the whole of the salt sent to Liverpool enters the Mersey at this point. It is only within the last five years that accommodation has been provided by the Trustees of the river Weaver at Weston Point for sea-going vessels of the same kind as those frequenting Runcorn.

The ports of Runcorn and Weston Point carry on nearly the whole of the coasting salt trade. Liverpool has nearly the whole of the foreign trade. The diminished depth and difficult navigation of the Upper Mersey confines the trade of the upper ports to vessels carrying from 300 tons downwards, and of a draught of water not exceeding from eleven to thirteen feet. During exceptional tides larger craft may visit these ports, but the trade is practically confined to vessels of the size just named.

The great salt ways to the Mersey ports are the river Weaver, the Grand Trunk and Bridgewater Canals, and the river Mersey. The railways are not used for salt for export purposes, as far as the Mersey is concerned. The river Weaver, by an Act of Parliament obtained in 1721, was made navigable from Winsford Bridge to the Mersey. Continual

improvements have been made from time to time, till now it is one of the best inland navigations in the country. It is managed by trustees chosen from amongst the chief gentlemen of Cheshire, who have no personal interest in the earnings of the river. Owing to the great improvements, steamers and sailing craft, capable of carrying up to 200 tons, are able to navigate the river. The salt is sent from the works to the ports in "flats," carrying from 70 to 200 tons. Of late years, many of these have been propelled by steam, but the majority are hauled down the Weaver by horses, and afterwards they sail down the Mersey. These vessels may be seen proceeding down the Mersey on the ebb tide nearly every day in the year.

The salt sent down the Grand Trunk Canal is conveyed in "narrow boats," sailing in pairs, and carrying about 60 tons the pair. Recently a hydraulic "lift" has been erected at Anderton, near Northwich, where the canal approaches the river. By means of this "lift" a boat and its cargo can be lowered from the canal to the river, or raised from the river to the canal, thus avoiding transhipment.

The exports of salt from the Mersey have increased to a very large extent during the present century. In the year 1800 there were exported from the Mersey 142,475 tons of white salt, and 34,939 tons of rock salt, a total of 177,414 tons. In 1832 we find 345,896 tons of white salt, and 94,400 tons of rock salt sent down the Weaver, being a total of 440,296 tons. Of this a considerable quantity was not for export. In 1844 the quantity of salt exported was 336,922 tons. In the years 1855, 1856, 1857, the exports were respectively 641,896 tons, 787,722 tons, and 644,998 tons. In 1864 the total exports were 738,409 tons. In 1871 the enormous quantity of 942,291 tons white salt, and 109,592 tons rock salt, or a total of 1,051,884 tons, was exported from the Mersey. The year 1875, just closed, shows an export of

932,731 tons of white salt, and 108,185 tons of rock salt, or a total of 1,040,916 tons. During the last five years the total export of all kinds of salt from the Mersey has been 4,844,019 tons.

The salt exports may be divided into white salt and rock salt. The proportions in which these salts are shipped are nearly constant, and had the late historian, Buckle, been alive, it would doubtless have given him great gratification to add this to his other instances of the constancy of averages. Although the items going to make up the total vary from year to year, the relative proportion is nearly the same. If we take the shipments for 1871, 1872, 1873, 1874, 1875, we find them to stand thus—

	White Salt. Tons.	Rock Salt. Tons.
1871	942,291	109,592
1872	799,858	88,784
1873	817,875	99,288
1874	843,555	101,865
1875	932,731	108,185

These statistics give the following proportions—

	White Salt.	Rock Salt.
1871	89·58	10·42
1872	90·00	10·00
1873	89·17	10·88
1874	89·28	10·77
1875	89·60	10·40

When it is known that the shipments of white salt and rock salt are not dependent on each other, nor in the slightest degree connected, but that there seems as much contrariety as is almost possible, the constant proportion is certainly very striking.

Looking at the gross total of salt shipments from the Mersey, we find Liverpool to export about 80 per cent., the

Upper Mersey ports 20 per cent. This proportion, though not nearly so constant as that of white salt and rock salt, does not fluctuate much, as will be seen by the following figures. A dangerous sandbank, nearly destroying the entrance to Runcorn docks, has driven a large amount of trade to Liverpool in 1875.

Percentages of gross shipments during 1871, 72, 73, 74,  
75—

	Liverpool.	Upper Mersey Ports.
1871	80·5	19·5
1872	81·8	18·7
1873	88·9	16·1
1874	80·8	19·2
1875	84·8	15·7

The proportion of the white salt shipments from the different ports has not fluctuated so much as that of rock salt, as for instance—

	White Salt.	Liverpool.	Upper Mersey Ports.
1871	88·8	...	16·2
1872	88·0	...	17·0
1873	85·7	...	14·3
1874	82·2	...	17·8
1875	85·1	...	14·9

	Rock Salt.
1871	52·4
1872	65·0
1873	69·9
1874	68·8
1875	74·3

We will now look at the distribution of the salt over the great divisions of the globe. Without troubling you with the quantities of salt shipped, the proportions shall be given,

and it will again be seen that there is an element of constancy pervading the salt exports of the Mersey.

In the years	1871,	1872,	1873,	1874,	1875,
Europe took	48·3	44·7	41·8	42·9	38·5
Asia "	26·0	26·4	21·8	27·6	30·0
Africa "	2·4	2·3	2·5	2·8	2·4
America "	27·4	25·5	32·0	25·4	26·5
Australia "	0·9	1·1	1·9	1·8	2·6
	—	—	—	—	—
	100·0	100·0	100·0	100·0	100·0

Taking the white salt and rock salt shipments separately, we shall obtain a proof of the little connection there is between them.

#### White Salt.

In the years	1871,	1872,	1873,	1874,	1875,
Europe took	87·3	89·3	85·9	87·0	82·8
Asia "	29·0	29·4	24·4	30·9	33·5
Africa "	2·7	2·5	2·8	3·2	2·7
America "	30·2	27·7	35·1	27·7	28·7
Australia "	0·8	1·1	1·8	1·2	2·8
	—	—	—	—	—
	100·0	100·0	100·0	100·0	100·0

#### Rock Salt.

Europe took	95·6	98·45	90·23	91·53	87·60
Asia "	0·0	0·00	0·00	0·00	0·00
Africa "	0·0	0·05	0·31	0·22	0·05
America "	8·3	5·20	6·15	6·51	7·20
Australia "	1·1	1·30	3·31	1·74	5·15
	—	—	—	—	—
	100·0	100·0	100·0	100·0	100·0

One of the oldest and most important of our foreign salt markets, and one which has been best known in Liverpool

for the longest time, is that of the United States. Prior to the late American war no country took anything like so much salt, or was so particular in the quality of what it took. Now, though still one of our best markets, the East Indies have surpassed it. The salt is sent to most of the chief seaports for carriage into the interior. The principal ports, however, are New York, Philadelphia, Baltimore and Boston, in the Northern States; New Orleans, Galveston, Savannah, in the South, with San Francisco, in the Pacific States. Cargoes are sent to many other ports as the emergencies of trade require. The United States possess brine springs and extensive salt works at Onondaga, in New York State, in Ohio, at Kanawha in West Virginia, in Michigan, and in at least twenty-three States of the Union, and rock salt in the Pacific States and Louisiana; yet English salt is found to be necessary, and competes successfully in nearly all parts of the country. For butter and cheese, and, to a great extent, for packing pork and beef, English salt is preferred. Although a heavy duty is placed upon English salt, it is much used, especially the finer kinds sent in bags, though, on the sea coast, and in districts remote from the American salt works, our ordinary common salt is used. During the last few years, owing to the increased price of English coarse salts, solar salts, made from sea water, in Spain, Portugal, the Mediterranean, and the West Indies, have nearly superseded them. The chief trade to the southern ports is carried on in ships going out for timber and cotton. These vessels frequently take salt as ballast, obtaining merely a nominal rate of freight. Again, to the port of New York especially, the steam vessels have nearly monopolised the whole of the salt, taking it, at times, at as low a rate as 2s. 6d. per ton from Liverpool.

Very small quantities of rock salt are sent to the United States, and these chiefly large lumps for cattle.

The shipments to the United States have been in—

	White Salt.	Rock Salt.
	Tons.	Tons.
1871	185,908	769
1872	150,915	1,488
1873	225,825	1,934
1874	176,930	1,477
1875	213,933	1,750

Next to the United States of America, we have our British North American Colonies. These take considerable quantities of salt, but for several years the exports have been decreasing. The trade to these colonies has located itself in Liverpool, and is carried on almost entirely in vessels going out for timber. With the exception of vessels going to Halifax and Newfoundland, very few ships go out expressly to take salt. Going for timber, they find salt the best and most expeditious lading, and for this reason take it at nominal rates, varying usually from 2s. 6d. to 5s. per ton for Quebec. Our trade with these colonies is chiefly carried on in the spring and summer months. With the exception of Halifax, the other ports may be considered closed from October to April. Montreal and Quebec, up the river St. Lawrence, and all the chief ports in New Brunswick, Nova Scotia and Prince Edward's Island, but especially Halifax and St. John's, N.B., take cargoes, generally of common salt for fish curing. Fine salt is sent up the St. Lawrence. Till within the last few years Newfoundland took very large quantities of coarse salt for fish curing. As in the United States, solar salt has nearly superseded English fishery salt. Our exports to these colonies have been affected by the increased price of English salt of late years, allowing solar salt to successfully compete with it, and also by the discovery of strong brine, and the consequent manufacture of good salt, at Goderich and neighbourhood, in Canada West.

Since the regulation of Lloyd's, requiring colonial built vessels to be partly salted whilst building, a considerable quantity of rock salt has been sent out to the shipbuilding ports.

The shipments to our British North American Colonies, during the last five years, have been—

	White Salt. Tons.	Rock Salt. Tons.
1871 ... ... ...	91,823	2,726
1872 ... ... ...	63,744	2,602
1873 ... ... ...	55,435	4,003
1874 .. ... ...	50,401	4,953
1875 ... ... ...	48,555½	5,897

The remainder of the American Continent takes but little salt. A few shipments of fine salt in sacks to Cuba, and in hogsheads to some of the other West Indian Islands, and an occasional lot to Central America, amounting in the whole to a few thousand tons annually, leave the port of Liverpool, generally in small quantities in general cargo vessels. Coarse salt being extensively made on a number of the Bahama Islands, especially on Turk's Island, from sea water, nothing but fine salt is sent. Beyond a few tons of rock salt sent to Jamaica, none of this description is exported. The average quantity of the salt shipped is about 4,000 tons.

South America, though a very extensive country, takes a very small quantity of English salt. Occasional lots go to the River Plate, though the great bulk used for curing hides in that district is obtained from Spain and Portugal. Small lots go to Valparaiso and Callao, and also at times to a few of the Brazilian ports. Salt is by no means scarce in South America, so the demand for English salt is not likely to be at any time large. Rock salt, in large lumps for cattle, is sent to Buenos Ayres, but not very extensively. The average quantity of salt annually shipped from Liverpool to the whole of South America, but slightly exceeds 2,000 tons.

The shipments to the West Indies and Central America have been—

	White Salt.	Rock Salt.
	Tons.	Tons.
1871	...   ...   ...   4,949	...   ...   ...   90
1872	...   ...   ...   8,539	...   ...   ...   48
1873	...   ...   ...   5,489	...   ...   ...   41
1874	...   ...   ...   8,972	...   ...   ...   22
1875	...   ...   ...   8,871	...   ...   ...   88

To South America the shipments have been—

	White Salt.	Rock Salt.
1871	...   ...   ...   2,279	...   ...   ...   7
1872	...   ...   ...   8,485	...   ...   ...   158
1873	...   ...   ...   1,116	...   ...   ...   122
1874	...   ...   ...   1,944	...   ...   ...   176
1875	...   ...   ...   2,480	...   ...   ...   160

AFRICA.—The average shipments to Africa are about  $2\frac{1}{2}$  per cent. of the total shipments. The African market is confined chiefly to the west coast, from the Gambia to the Gaboon. The salt is distributed, in quantities varying from five tons to several hundreds, at one or other of the ports at which the steamers sailing from Liverpool call. This trade was carried on entirely by sailing vessels at one time, some of which took full cargoes of salt, but generally small vessels were loaded with a general cargo consisting partly of salt. The usual custom in this trade, as in several others, was to get as much general cargo as possible, and then fill up with salt, the unfailing resort of all charterers of ships at the end of their lay days, salt being generally obtainable in any quantities at a very short notice. Occasionally a cargo, or part of a cargo, is sent to Cape Town, and, at wide intervals, to Natal. No other parts of Africa take salt. In fact, Africa possesses enormous stores of salt in many parts of the interior,

therefore does not need to import it. The larger portion of the salt sent is stoved salt; occasionally lots of coarse fishery and common have been sent, and a few lots of rock salt. This is entirely a Liverpool trade; a solitary vessel once a year may leave Runcorn. As compared with America or Asia, the African shipments are very small. During the last five years they have been—

White Salt.

1871.	1872.	1873.	1874.	1875.
24,066	20,189	22,096	26,570	25,178 tons.

Rock Salt.

1871.	1872.	1873.	1874.	1875.
0	894	308	229	54 tons.

**ASIA.**—No salt market has increased so rapidly as the Asiatic, and this is almost entirely the East Indian, for, as a rule, all the salt shipped to Asia goes to the East Indies. A small quantity has been sent to Yokohama, in Japan, once or twice, but there is no regular trade at present. In China, English salt is prohibited. No rock salt is sent at all.

This trade is a very peculiar one. All the salt for use in the East Indies was procured either from the sea water, as all round the coasts, or from the salt lake Sambur, and the Runn of Cutch, or else in the shape of rock salt from the great salt range of mountains in the Punjab. There was no deficiency in the supply of salt, but that made along the coasts of the Bay of Bengal was of very inferior quality; this inferiority has enabled English salt to compete successfully in the Bengal Presidency, and it is expected that shortly the Madras Presidency will take our salt. There is an enormous duty, amounting to about £5 per ton, on all salt in India. The East Indian trade, unlike most trades, does not depend altogether on the demand for salt. The great object in trying to open the East Indies to our salt, was the obtaining

cheap dead weight cargoes for our large merchant ships going out to bring home East Indian produce. Vessels take salt irrespective of the demand in Calcutta. The result is, that very often the ship obtains a freight so low as to cause a loss on the outward voyage, which is recouped by the homeward freight. Liverpool, of course, has the whole of this trade, and it forms the most valuable portion of the salt trade. Ships frequently take from 1,500 to 2,200 tons at once; thus one cargo very often nearly equals a year's shipments to South America.

The salt sent is all fine salt, though a few cargoes of coarse salt have been exported to Rangoon. Calcutta takes by far the largest quantity of salt. Cargoes are sent also to Chittagong and Rangoon, and a solitary cargo has been exported to Penang. No salt is shipped from England to the Bombay Presidency, as the salt manufactured on the sea coasts and on the Runn of Cutch is very good in quality, and so cheap that our salt cannot compete with it in the market.

Prior to 1845 no English salt was admitted into India. The growth of this branch of the salt trade has been most remarkable. In the ten years, from 1845 to 1855, the quantity sent was 269,747 tons, an annual average of 26,974 tons. From 1855 to 1865, 1,269,523 tons, an annual average of 126,953 tons. From 1865 to 1875, the quantity sent was 2,122,899 tons, an annual average of 212,289 tons. In 1875 no less than 311,828 tons have been sent out. A recent letter from Rangoon reports English salt from that place being conveyed by Chinamen into China.

AUSTRALASIA.—The Australasian trade is almost entirely confined to Australia; a few small lots of salt are sent to Auckland and Otago, in New Zealand. The Australasian salt trade is carried on with the ports of Adelaide, Melbourne, Sydney, and Brisbane. Melbourne is the most important

market, and Sydney the next. A considerable portion of the Australian salt is rock salt, in large lumps for cattle, and most of this goes to Sydney. The white salt is partly fine stoved salt, partly common, both in strong sacks. The Australasian trade is wholly confined to Liverpool, and no ship takes a full cargo of salt. Ships on the berth take salt as a portion of their cargo almost invariably, and, as in many other cases, fill up with salt when other cargo runs short. No salt is sent to West Australia from Liverpool, owing, as I suppose, to there being no regular communication carried on with that country, and also to its possessing salt lakes. Of late a fair quantity has been shipped to Brisbane, in Queensland. The Australian market is a very irregular and uncertain one, and dangerous for shippers, as it soon becomes overstocked. Salt is sent from London in the Australian liners. The shipments from the Mersey have been—

	White Salt.	Rock Salt.
	Tons.	Tons.
1871	... ... ... 7,592	... ... ... 1,233
1872	... ... ... 8,859	... ... ... 1,171
1873	... ... ... 14,465	... ... ... 8,291
1874	... ... ... 10,890	... ... ... 1,766
1875	... ... ... 21,400	... ... ... 5,520

EUROPE.—The European salt market, including the British Islands, is the most important of our markets. A glance at the map before you will show that the whole of our salt trade is confined to Europe, North of France. A few cargoes are sent to Jersey and Guernsey, and now and again a solitary cargo to Boulogne or Dunkirk. In my Paper on the great salt districts of Europe, published in the Society's proceedings for 1873–1874, I inserted a map; the original I have placed before you, and it will show why no salt is required in the South of Europe and France.

RUSSIA takes the most salt of any country in Europe. The season of shipment commences in April and ends in October. In this respect it resembles Canada. The port of Archangel takes a fair quantity of salt, which is shipped in the months of May, June, and July. The Finland ports of Russia very rarely take salt. Wyborg, St. Petersburg, Cronstadt, Narva, Pernau, and Riga are the principal ports to which salt is sent, with now and again cargoes to other smaller ports. The vessels going out rely chiefly upon obtaining homeward freights of timber or flax. Liverpool is very busy in April and May with vessels taking salt, and bound to the Russian Baltic ports. The Cronstadt trade is carried on to a great extent by steamers. As the other Russian salt ports are all shallow water ports, only small vessels of from 200 to 350 tons usually go there. This enables the Upper Mersey ports to compete in the trade, and vessels which arrive in ballast from outports to load salt generally go up to Runcorn or Weston Point, chiefly the latter. The salt being about one shilling per ton cheaper, the vessel generally gets this amount of additional freight, besides having lighter expenses. The salt sent to Russia is almost entirely coarse salt. Up till recently, at several ports, it was a mixture of very coarse fishery salt and very fine butter salt; this was owing to custom restrictions. To the port of Riga there is sent every year from 2,000 to 3,000 tons of the finest and largest lump rock salt. No salt is sent to Southern Russia, as it possesses plenty of its own production. The shipments to Russia during the last five years have been—

#### White Salt.

1871.	1872.	1873.	1874.	1875.
47,214	59,672	72,350	67,168	49,505 tons.

#### Rock Salt.

1,917	2,261	2,472	2,953	2,904 tons.
-------	-------	-------	-------	-------------

**PRUSSIA.**—Germany, being well supplied with rock salt and brine springs of her own, has not much need of English salt. The only district taking it is East Prussia, which, lying at a considerable distance from the German salt districts, and having cheap water communication with Poland, takes a considerable quantity of salt annually. The ports to which the salt is sent are Memel, Königsberg, Pillau, Dantzig, and Neufahrwasser. An occasional cargo is sent to Stettin or Swinemunde. German vessels coming over with timber take nearly all the salt as back cargo, with the exception of the Königsberg salt, which is sent in small vessels of any nation willing to go. The freights to the larger ports rule low—8s. and 9s. per ton for Dantzig as an average. These low rates enable a trade to be done. It is very rare that any salt is sent to the ports of Germany on the North Sea. Occasionally cargoes are sent to the Schleswig and Holstein ports, as in the times when they were possessed by Denmark. The salt sent is almost entirely common salt in bulk, which is shipped at Liverpool. The shipments for the last five years have been—

White Salt.

1871.	1872.	1873.	1874.	1875.
40,202	84,930	86,809	27,617	88,730 tons.

**NORWAY AND SWEDEN.**—This market is but a small one. Sweden takes scarcely any salt. A few cargoes are sent to Gottenburg. Norway takes much more than Sweden. During the early summer months of May and June a number of cargoes of common salt for fishery purposes are sent (to use the trade term) to the “North Cape,” meaning the ports of Tromsoe, Hammerfest, Vardoe, and Vadsoe. The vessels taking these cargoes, after discharging, go to Archangel and other White Sea ports, for tar, oats, &c. The other ports of Norway, as Drontheim, Bergen, Christiansand, Christiansund,

Christiania, Tonsberg, take cargoes at no regular periods, but generally when vessels from those ports arrive in Liverpool and wish to go home. The salt is either common or fishery salt. The Norwegians use much coarse salt for fishery purposes, taking a large portion from the South European countries that take their salt fish. The shipments for the last few years have been—

1872.	1873.	1874.	1875.
7,813	8,174	11,576	10,167 tons.

**DENMARK AND ICELAND.**—Denmark and her European possessions of Iceland and the Faroe Islands take a great portion of their requirements, in the way of salt, from the Mersey. Shipments are being made during the whole year to Denmark, but chiefly during the summer months, when small Danish vessels arrive with corn from home, or cargo from other districts. Nearly all the Danish trade is carried on in Danish vessels from the ports to which the salt is sent. Copenhagen forms an exception to this, and much larger cargoes, especially of rock salt, are sent there. Rock salt is sent to several other smaller ports. The Faroe Islands take coarse salt for fish curing. Every season a number of Iceland, Danish, English, and Spanish vessels take salt to Iceland. This is generally either common salt or coarse salt, intended for fish curing. The Iceland vessels come to Liverpool with wool, ponies, and fish, and return with salt, principally to Reikjavik and Isafjord. The rock salt sent to Denmark is used for melting down into brine, and then refining and manufacturing into white salt. The shipments for the last four years have been—

White Salt.				
1872.	1873.	1874.	1875.	
7,225	9,143	9,408	8,132 tons.	
Rock Salt.				
4,389	2,520	2,599	4,392 tons.	

**BELGIUM AND HOLLAND.**—For a long series of years Belgium and Holland imported salt under the same laws, doubtless such as had existed when they formed one kingdom. Under these laws white salt was practically prohibited ; thus, until within the last five years, all our salt exports from the Mersey to these countries were rock salt. On the first of January, 1871, Belgium repealed her salt duties, and allowed this article to come in free ; since which period white salt has been sent as well as rock salt, but only in small quantities. Rock salt is exported more largely to Holland and Belgium than to any other portions of the world. Fully three-fourths of all the rock salt exported from the Mersey goes to Holland and Belgium. Belgium takes rather more than Holland. Both countries use the salt for refining purposes. Up to the last ten years most of this trade was carried on by Dutch and Belgian vessels, and most of the galliots visiting the Mersey carried salt home. English vessels, after a time, monopolised the trade, and now it is almost entirely in English ships. The regular Belgian and Dutch traders are seen in our ports no longer. At first, sailing vessels carried on the trade, then the Rotterdam steamers monopolised the chief Dutch trade, leaving sailing vessels to take cargoes to the ports not visited by steamers. The Antwerp steamers have, within the last few years, nearly monopolised the Belgian trade. These steamers find rock salt convenient as dead weight cargo, and so take it at a low rate of freight. Within the last few years, the trade which chiefly centred in the Upper Mersey ports has migrated to Liverpool, from whence the steamers sail.

The shipments during the last five years have been—

White Salt (entirely to Belgium.)				
1871.	1872.	1873.	1874.	1875.
28,825	5,221	3,527	4,651	4,879 tons.

## Rock Salt.

1871.	1872.	1873.	1874.	1875.
78,740	57,925	64,425	67,521	66,604 tons.

The extensive shipments of 1871 were the result of the Franco-German war, Belgium supplying both parties with salt provisions, and being unable to get any salt from Eastern France.

**FRANCE AND REMAINDER OF EUROPE.**—If we except the Channel Islands, practically no English salt is sent to the remainder of Europe. A cargo, or part of a cargo, once a year, is all that is shipped from the Mersey. France, Spain, Portugal, and the countries bordering on the Mediterranean supply all their needs from the sea, though in France, Spain, and Italy there are salt manufactories where brine from springs is used. Rock salt also is found pretty freely. In the exports of salt from the Mersey, the customs authorities consider Jersey and Guernsey as foreign islands, so I have put their salt under this head. The shipments for the last five years have been—

1871.	1872.	1873.	1874.	1875.
1,451	1,179	2,170	3,226	1,274 tons.

Occasionally a small quantity of rock salt is sent, but scarcely worth mentioning.

The BRITISH ISLANDS take a very large quantity of salt of all descriptions from the ports of the Mersey. As far as England is concerned, the railways take so much salt, that if we were simply to compare the exports from the Mersey, we should gain a very erroneous idea of the relative quantities taken by England, Ireland, and Scotland. The great centres for the use of Cheshire salt are Newcastle-on-Tyne and neighbourhood; South Lancashire, in the neighbourhoods of St. Helens and Widnes, and the banks of the estuary of the

Dee. These are the great chemical manufacturing districts. With the exception of Newcastle-on-Tyne, which takes a portion of its requirements from the Mersey, the railways and canals carry all the salt used in the chemical districts. In Scotland, the great centre of the chemical trade is Glasgow and neighbourhood, and nearly all the salt is sent from the Mersey, chiefly by the Glasgow traders, as the vessels constantly running between Glasgow and Liverpool are called. Ireland possesses no very extensive chemical works. Dublin is the chief importer of salt for this purpose from the Mersey. Besides the chemical manufactories of the parts of the United Kingdom just mentioned, which take so large a portion of the salt exports coastwise of the Mersey ports, we have the fisheries. During the fishing season, and a short time prior to its commencement, there is a large demand for small vessels to take fishery salt to the fishing ports. The ports of the east coast of Scotland, the most important of which are Wick, Peterhead, and Fraserburg, need an enormous quantity of salt. The following statistics will show this clearly. In the year 1875 fishery salt was sent to the east coast of Scotland during the months from April to September, but chiefly in June and July—

April	...	2,150	tons	in	18	vessels
May	...	7,933	"	"	55	"
June	...	17,971	"	"	128	"
July	...	15,094	"	"	118	"
August		5,030	"	"	36	"
<hr/>						
		47,578	"	"	955	"

The ports of Whitby and Scarborough take a small quantity of fishery salt during the summer months, but Yarmouth and Lowestoft take the great bulk of the fishery salt sent to the English ports. As in the case of the salt sent to the east coast of Scotland, so in that sent to Yarmouth

and Lowestoft, the great bulk is shipped at Runcorn and Weston Point. Out of 10,246 tons sent to these ports in 1874, 9,576 tons were shipped at the Upper Mersey ports in fifty-nine vessels.

Cargoes of salt are sent during the year at intervals to numerous small ports around the coasts of England, Ireland, and Scotland, particularly to Cornwall in the pilchard season, and to the Irish ports in the fishing season, but there are no large salt consuming districts requiring salt from the Mersey except those mentioned.

The quantities of salt shipped coastwise from the Mersey ports have been—

	1871.	1872.	1873.	1874.	1875
England	71,783	67,370	52,485	66,474	81,450
Ireland	58,728	58,640	48,907	43,675	41,637
Scotland	91,122	71,951	60,164	78,921	75,215
	221,583	197,961	161,556	189,070	198,802

By far the largest portion of the salt exported from the Mersey is shipped in bulk. This applies to the whole of the East Indian trade, all the coastwise, fishing and chemical trades, all of the Baltic trade, with very slight exceptions, and a considerable portion of the American trade. The Australian salt, except the rock salt, and even that, at times, is sent in strong corn sacks. The voyage being long and freight high, salt must not be wasted. A portion of the African salt is sent in bulk, a part in sacks, and a portion in casks going out for palm oil. The South American and West Indian salt goes in sacks and sugar hogsheads. The whole of the fine salts going to the United States are sent in sacks of a very fine quality, whilst a considerable quantity of the coarser kind sent to the Southern States, also to British North America, goes in a cheap Dundee sack. The usual size of the sack is one that holds two cwt. of salt. The

enormous number of sacks used, and the consequent large trade in them, will be seen from the following figures of the sacks filled with salt, shipped from Liverpool in 1875, the sack trade being entirely centred in Liverpool—

January	...	...	...	...	...	...	208,880
February	...	...	...	...	...	...	145,700
March	...	...	...	...	...	...	115,885
April	...	...	...	...	...	...	208,135
May	...	...	...	...	...	...	172,500
June	...	...	...	...	...	...	147,910
July	...	...	...	...	...	...	163,770
August	...	...	...	...	...	...	154,690
September	...	...	...	...	...	...	179,500
October	...	...	...	...	...	...	214,580
November	...	...	...	...	...	...	216,115
December	...	...	...	...	...	...	210,295

2,182,960 sacks,

containing over 200,000 tons of salt.

The Cheshire salt trade owes much of its great extent and prosperity to its nearness to the ports of the Mersey; and Liverpool, Runcorn, and Weston Point are deeply indebted to the salt trade for much of their success. It must be borne in mind that the element of cost of carriage enters very largely into the salt trade. Were it not that very low freights are constantly to be had for many countries from the Mersey, salt could not be sent to these countries. When ships accept cargoes to ports, one of the first points to be considered is the chance of obtaining back cargo. Liverpool can always rely upon salt as a cargo quickly loaded; consequently, vessels visiting Liverpool can rely (other cargoes failing) upon getting salt. Take the East Indian trade. There is not sufficient cargo to supply one-fourth of the vessels going to

Calcutta, if we except salt. But salt being required in India, and easily obtainable in Liverpool, the East Indian trade centres largely in Liverpool. Ships leave London and other ports, after discharging cargo, and come to Liverpool for salt. The despatch given is very great. Look, again, at the Upper Mersey ports. Nearly all the clay, flints, and china stone used in the Potteries are sent to Buncorn and Weston Point; thence they go up the canals into Staffordshire. Vessels bring the clay cheaply, knowing they will obtain salt or coals back again. The favourite run of the Cornish clay vessels illustrates well the principle I am pointing out. Clay from Cornwall to the Upper Mersey ports; salt thence to the Tyne; coal from the Tyne to Cornwall. The salt connects the coal and clay. It would be easy to take a number of countries and show the effect upon the salt trade of the proximity of the Mersey ports, and the certainty of always obtaining vessels for these countries. Many countries, as the United States, Canada, Russia, Prussia, &c., possess salt of their own, but the cheap water carriage from Liverpool enables Cheshire to place salt at many of the ports of these countries at cheaper rates than the domestic salt can be sent there by rail, river, or road. A few illustrations will suffice.

Freights to New York have been from 2s. per ton upwards, but for a long time 3s. and 3s. 6d. have been current. Thus it costs as much from Northwich to Liverpool as from Liverpool to New York. No part of the British Islands, unless in the immediate proximity of the salt works, obtains salt so cheaply as New York. From Liverpool to Quebec the rate is from 2s. 6d. to 5s.; from Liverpool to Glasgow, 4s. to 5s.; Liverpool to Dublin, 5s. and upwards; to the Tyne 7s. and upwards, occasionally a trifle less; to other east coast ports, 8s. to 11s. The ports of Riga and Pernau get salt as cheaply as

the Scotch fishing ports, and Dantzic cheaper than Belgium or Holland. The Calcutta freights have varied from 12s. 6d. to 47s., but generally rule low.

How important an element in the trade of the Mersey salt is may be judged from the quantity shipped. After coal and iron, salt is the most bulky of our exports, though not the most valuable. The salt trade at Liverpool is a very old one, and has grown with the growth of the port. It cannot pretend to compete with the coal and iron trades; but when it finds employment for a million tons of shipping annually, it is a trade that Liverpool people ought to know something about, but about which very little indeed is ever written. My object in writing this Paper has been to endeavour to put the trade in its proper position amongst the great trades carried on from the Mersey ports.

## SUMMARY

or

## SALT EXPORTS FROM THE MERSEY PORTS

DURING 1871, 1872, 1873, 1874, 1875.

## WHITE SALT.

	1871.	1872.	1873.	1874.	1875.
	TONS.	TONS.	TONS.	TONS.	TONS.
United States of America	185,908 $\frac{1}{4}$	150,915 $\frac{1}{4}$	225,825 $\frac{1}{4}$	176,980	213,988
British North America ..	91,823 $\frac{1}{4}$	63,744 $\frac{1}{4}$	55,455 $\frac{1}{4}$	50,603 $\frac{1}{4}$	48,555 $\frac{1}{4}$
West Indies and Central America ..	4,949 $\frac{1}{4}$	8,539 $\frac{1}{4}$	5,489 $\frac{1}{4}$	8,972 $\frac{1}{4}$	8,871
South America ..	2,279 $\frac{1}{4}$	8,485	1,116	1,944 $\frac{1}{4}$	2,480
Africa ..	25,170 $\frac{1}{4}$	20,189 $\frac{1}{4}$	22,686 $\frac{1}{4}$	26,600 $\frac{1}{4}$	25,178
East Indies ..	273,191 $\frac{1}{4}$	284,942	199,607 $\frac{1}{4}$	260,395 $\frac{1}{4}$	311,828 $\frac{1}{4}$
Australasia ..	7,592	8,859	14,465 $\frac{1}{4}$	10,890 $\frac{1}{4}$	21,400
Germany ..	40,202	84,980 $\frac{1}{4}$	86,809	27,617	83,780
Russia ..	47,214 $\frac{1}{4}$	59,672 $\frac{1}{4}$	72,350 $\frac{1}{4}$	67,168 $\frac{1}{4}$	49,505
Denmark and Scandinavia ..	17,099	15,088 $\frac{1}{4}$	17,317 $\frac{1}{4}$	20,985	18,299 $\frac{1}{4}$
Belgium and Holland ..	23,925 $\frac{1}{4}$	5,401 $\frac{1}{4}$	8,527	4,651 $\frac{1}{4}$	4,879
France ..	1,451 $\frac{1}{4}$	1,179 $\frac{1}{4}$	2,170 $\frac{1}{4}$	3,226	1,274
England ..	71,733	67,370	52,485	66,474	81,450
Ireland ..	58,728 $\frac{1}{4}$	58,640	48,907	43,675	41,637
Scotland ..	91,122	71,951	60,164	78,921	75,215
<b>TOTAL WHITE SALT ..</b>	<b>942,291<math>\frac{1}{4}</math></b>	<b>799,858<math>\frac{1}{4}</math></b>	<b>817,875<math>\frac{1}{4}</math></b>	<b>848,555</b>	<b>982,731</b>

## ROCK SALT.

	1871.	1872.	1873.	1874.	1875.
	TONS.	TONS.	TONS.	TONS.	TONS.
America ..	8,593 $\frac{1}{4}$	4,621 $\frac{1}{4}$	6,102	6,829 $\frac{1}{4}$	7,785
Africa ..	..	11 $\frac{1}{4}$	308	229	54
Asia ..	..	..	..	..	..
Australasia ..	1,238	1,171	8,291 $\frac{1}{4}$	1,766 $\frac{1}{4}$	5,520 $\frac{1}{4}$
Europe ..	104,766 $\frac{1}{4}$	82,980 $\frac{1}{4}$	89,583	98,241	94,825 $\frac{1}{4}$
<b>TOTAL ROCK SALT ..</b>	<b>109,592<math>\frac{1}{4}</math></b>	<b>88,784<math>\frac{1}{4}</math></b>	<b>99,288<math>\frac{1}{4}</math></b>	<b>101,865<math>\frac{1}{4}</math></b>	<b>108,185</b>
<b>GROSS TOTAL ROCK AND WHITE SALT ..</b>	<b>1,051,884</b>	<b>888,648<math>\frac{1}{4}</math></b>	<b>917,159<math>\frac{1}{4}</math></b>	<b>945,420<math>\frac{1}{4}</math></b>	<b>1,040,916</b>

**TOTAL FOR FIVE YEARS .. .... 4,844,028 $\frac{1}{4}$  TONS.**



## ON INDIAN SNAKES.

By EDWARD NICHOLSON, F.C.S.,  
ARMY MEDICAL DEPARTMENT.

HAVING been honoured by an invitation to speak before this Society on the subject of Indian snakes, I have thought that I could best utilise the time in which a short lecture can be given, by taking successively the various points on which I have observed erroneous ideas to be generally entertained, and, while correcting the popular errors, to establish a few of the most important facts relating to the natural history of this order of reptiles. I shall endeavour in each case to sift out the grains of truth from the proverbial pound of error.

**ERROR I.—***All snakes are more or less venomous, and it is always well to kill a snake, as it may be a venomous one.*

Out of two hundred and sixty species of land snakes found in the large part of Asia known as the East Indies, there are forty which are more or less venomous, but not more than five which are dangerous to human life. Even these five may be further reduced, for one of them (the hamadryad, *Ophio-phagus elaps*) is very rare, and another replaces a congener, the two being rarely found together; so that, practically, there are but three snakes the bite of which is dangerous to human life—

- |                              |                                  |
|------------------------------|----------------------------------|
| The Cobra . . . . .          | <i>Naga tripudians.</i>          |
| The Bungarus . . . . .       | <i>Bungarus arcuatus.</i>        |
|                              | { <i>B. fasciatus</i> (Malayan). |
| The Daboia, or chain-viper . | <i>Daboia elegans.</i>           |

The first of these, the cobra, is a very common snake throughout the East Indies, and it causes fully nineteen out of twenty accidents to man. This snake can be recognised at once, by its habit of raising its head and neck from the ground when menaced, and of standing at bay with the skin of its neck expanded into a broad oval disk, ornamented on the back by a black ocellus, or by a pair of ocelli united like eye-glasses.

The bungarus of India (sometimes known as the *krait*) is generally found of much smaller dimensions than its full length of four feet. It is pure white beneath, jet black above, with narrow white arches, generally in pairs, extending across the back. Though very venomous, it is of gentle disposition, and does but little mischief compared to the cobra.

The species of bungarus belonging to the Malayan fauna is very rare in India; it grows to a much larger size than the species just described, and it is known at once by the bands of alternate black and yellow which encircle it.

The viper, *Daboia elegans*, or *D. Russellii*, known as the chain-viper, the *cobra manilha*, and in Ceylon as the *tic polonga*, is a sluggish snake, rarely found away from the sea-coast. It is finely marked with three chains of black links extending down the back, and has the triangular head characteristic of the viperine and crotaline snakes. Though much less akin than the green tree-viper to the American *Crotalidæ*, it may yet be said to be the Indian representative of the rattlesnake. Its poison apparatus is very highly developed.

In by far the greater part of India, the *Daboia* viper is all but absent, leaving, then, only two venomous snakes dangerous to man.

The other venomous snakes, which are more or less common, yet not dangerous to man, are:—

The tree-vipers, represented by the most common species, *Trimesurus viridis*.

The echis viper, *Echis carinata*.

The various species of *Callophis*.

All these are of local occurrence, and decidedly rare. It is remarkable that the tree-vipers, which are very closely related to the American *Crotalidae* (though quite destitute of any rattling candal appendage), have poison of very little power on even small animals.

With regard to the harmless snakes, their distribution is so variable that it is by no means easy to select the list of common species. The commonest are—

*Ptyas mucosus* . . . . . the dhāman.

*Tropidonotus quincunciatu*s . the checkered snake.

*T. stolatus* . . . . . the chameleon snake.

*T. plumbeicolor* . . . . . the green grass snake.

*Lycodon aulicus* . . . . . the brown snake, or carpet snake.

*Passerita mycterizans* . . . . the green tree-snake.

*Dipsas gokool* . . . . . the brown tree-snake.

These are all perfectly harmless. The first of them, *Ptyas mucosus*, grows to a large size, nine feet in length, and lives principally on rats. This snake and the cobra are of great use in keeping down the plague of rats in India.

ERROR II.—*Snakes are slimy, disgusting reptiles, which it is right to kill.*

The refutation of this error, though apparently easy, is in reality most difficult, for it attacks one of the most deep-seated prejudices of civilised man. The error is a survival (though reversed) of the fetish period of human intellect; an iconoclastic revolt against the gods of primitive man, enabling us to indulge freely in the passion of destructiveness. The Anglo-Indian is unconscious of this subjective motive; the objective motive is disgust, and its effects exemplify admirably the remarks made on this emotion by

Mr. Bain, in his work on the *Emotions and the Will*. “The enunciation of disgust is a favourite exercise. \* \* \* The objects thus sought out need not offend the senses in any way; if they can only furnish a slight pretext for being nasty or unclean, it is enough for letting off the charged battery of the powerful organ of disgust. If any class of living beings should happen to provoke this outburst, terrible is their fate. No limits are set to the promptings for evil of this sentiment.”

In the present case, the excuse that snakes are slimy is contrary to fact; that they are nasty and disgusting is a prejudice conceived before the persons enouncing it ever saw a snake. Observation cannot rectify the error, for, as the late Sir Arthur Helps says (*Friends in Council*), “a good sound prejudice is not to be contradicted by mere eyesight and observation.”

### ERROR III.—*Snakes leave a trail behind them.*

The trail of the serpent has long formed a simile for the novelist. It is generally supposed that snakes leave a slimy trail, like that of a slug. But a snake is covered with a coat of scales as dry, clean, and polished as silver; whence the error? It doubtless arises, firstly, from the snake being considered as a sort of land-eel (*anguille de bois*, as the omnivorous French peasant calls it), and secondly, from the fact that snakes cast their epidermis at intervals of a few weeks, at least during their period of growth. The snake manages to stick the thin scarf-skin, loosened from his nose and chin, on to some convenient object, and then peels himself out, leaving the delicate film of skin inside out. This has the misfortune to be called a slough, and it may be called a trail (as it is left behind), but it is anything but slimy, except if left exposed to rain or to dew, when it would tend to dissolve and assume a glutinous consistence. Also,

if a snake were killed just before the casting, or when sick, the skin might possibly come off in shreds, and the new skin beneath might feel sticky at first, giving rise to the general idea of sliminess attached to snakes.

**ERROR IV.** *Snakes have a forked sting, which they dart out at their enemies.*

The so-called sting is the long bifid tongue common to the snakes and most of the lizards. It is usually retracted in a sheath below the windpipe, and is capable of rapid and vibrating protrusion through a chink in the rostral shield, without the mouth being opened. It appears to be the principal organ of touch, and is perhaps useful in early life for catching insects before the regular prey of the snake can be attacked.

This tongue is very highly developed in the large water-lizards (*varanus*) ; these are often called *bis-cobras* by low blacks desirous of humbugging their masters ; and the fable of the venomous *bis-cobra* is dear to the Anglo-Indian.

**ERROR V.—***Venomous snakes have long curved fangs, which usually lie supine, and are erected when required for use.*

This is true only of the viperine snakes. The poison fangs of the venomous colubrine snakes (such as the cobra and the bungarus) are never less than semi-erect, often permanently erect. In the largest specimens of the cobra they scarcely exceed one-fourth of an inch in length, while in the bungarus, in the venomous snakes of Australia, in the sea-snakes, they are much shorter, and sometimes even scarcely perceptible. Yet such is the force of prejudice, that, in a popular work on natural history, the writer (who is a surgeon, and claims to be a zoologist), standing before preparations of the cobra in the Museum of the College of Surgeons, tells

his readers that the cobra has on each side of its mouth two teeth, fixed at the extremity of the upper jaw; that the largest of the two teeth is nearly an inch in length; and that the teeth lie, in a quiescent state, quite parallel to the jaw. What the writer really saw will be explained under the head of the next error.

**ERROR VI.—*Each poison fang has a reserve fang behind, ready to replace it in case of accident.***

This is incorrect. All snakes, venomous or harmless, shed *all* their teeth at intervals; the poison fangs, when present, follow the rule, there being no exceptional law for them, merely a modification of the general law. In the maxilla of venomous snakes there are, in front, two alveoli, side by side; one (generally the outer one) usually occupied by the mature fang in use, the inner one by the "first in waiting" of the numerous future fangs. These vary in development, from the merest embryo of a tooth to the fully developed fang still loosely attached to the alveolus. When the old fang is shed, naturally or by violence, the new fang, having plenty of room, becomes firmly attached to the jaw, and works towards the principal alveolus, being gradually pushed aside by the next fang in growth. If a fang were broken off or torn out, it would not be replaced much before the proper time. All these fangs are covered by a loose fold of gum, or mucous membrane. But what I have said of the poison fangs is applicable, on a smaller scale, to all the other teeth.

**ERROR VII.—*The poison is contained in a bag at the base of the fang, and is sent through the fang when this presses on the bag in the act of biting.***

This is quite erroneous. The poison is the salivary secretion of the parotid gland, which lies on the cheek behind the eye. The poison, when ejected by voluntary effort,

passes direct by a duct to the inside of the fold of gum (or mucous membrane) enveloping the fang. The terminal orifice of the duct is exactly in front of the basal orifice of the hollow fang. When an animal is bitten, the pressure puckers up this fold round the fang, and prevents the escape of the jet of poison otherwise than through the fang. Were the fold of gum not to act, the poison would escape along the outside of the fang.

**ERROR VIII.—*A venomous snake may be recognised by the peculiar formation of its head, or by other general signs.***

This is incorrect. The converse is to some extent true, inasmuch as the viperine snakes have a peculiar triangular head (like a sextant box). But the venomous colubrine snakes have no such peculiarity, their heads being of the same oval shape as those of harmless colubrine snakes. It is true that they differ from the latter by the absence of the loreal shield, but this is absent in some harmless snakes. All such general rules are devoid of value, and lead into error. It is better to learn the appearance of the three or four venomous snakes likely to be met with.

**ERROR IX.—*The male cobra is different in appearance from the female.***

The so-called "male cobra" is *Ptyas mucosus*, the dhaman. The only points of resemblance between this snake and the cobra is, that both grow to a large size, that they are often of the same brown colour, and that both of them live principally on rats. The error is a silly one, but very general.

**ERROR X.—*The cobra grows to upwards of six feet in length.***

The cobra supersedes the tiger in modern Indian travellers' tales. Nearly every Anglo-Indian will say that he has

seen cobras above six feet in length. I do not deny that a cobra might possibly be found six feet long, but I know that the odds are at least 1000 to 1 against it. The cobra is about eleven inches long when hatched, and by the rule that the adult length of a snake is six times its length at birth, the adult length of the cobra should be five feet six inches; this is found to be the case, and when the cobra attains this length it begins to increase in bulk rather than in length, and specimens three inches above this are rare.

**ERROR XI.—*There are snakes which can crush a buffalo or other such animal in their coils, and then swallow it.***

However devoid of intelligence a snake may be (notwithstanding its proverbial subtlety), it would hardly take the trouble to pursue and seize an animal which it is incapable of swallowing. Snakes nearly invariably swallow their prey alive, and rarely seize any animal more than a quarter of their own weight. A large python could swallow a kid, or one of the smaller kinds of deer; but it is a snake of low intelligence, and when reduced to idiocy by long confinement it appears sometimes to attempt suicide by swallowing its blanket; it is therefore possible that it might attack a buffalo, but it is certain that it could not swallow it, and its powers of compression are very doubtful.

**ERROR XII.—*There is a double-headed snake, each end of its body performing the functions of head alternately for six months in the year.***

This fiction, very generally believed among Anglo-Indians, is said of *Eryx Johnii*, a sluggish snake, of low development. Jugglers mutilate the stumpy tail of this snake, and pretend that this is the new head growing. The belief in the possibility of such a thing originates, doubtless, in a sun-myth.

**ERROR XIII.—*Snakes exercise a power of fascination over their prey.***

I have never seen any trace of this. Animals placed in a snake's cage as food show the greatest anxiety to escape; when the snake moves to catch them they run about; if the snake remains quiet they soon get accustomed to it. Mice sit on the back of a snake devoid of appetite; birds flutter about in their cage if a snake tries to get in (as I have seen it do).

**ERROR XIV.—*Snakes are very sensitive to music; they dance to it, and are attracted by it out of their holes.***

Snakes can have very little appreciation of sound, considering that they have no external auditory apparatus. Sounds are conducted to the hidden ear by the stapes, a long, slender bone, which projects backwards out of the base of the skull. The cobra receives its specific name, *Naga tripudians*, from its supposed habit of tripudiating, or dancing. The French naturalists translate this name as *naje baladine*. It simply stands at bay when irritated by the juggler playing his gourd-pipes close to it. When the juggler pulls out the snake which he is supposed to have attracted from its hole by the charms of his music, I need hardly say that the snake is produced by a clever sleight of hand.

**ERROR XV.—*Snake-charmers possess antidotes against snake-poison.***

When the charmer or juggler causes himself to be bitten by a cobra, the snake has nearly always been rendered harmless, either by the extraction of its fangs or by the establishment of a fistula in the course of the poison-duct. The antidote, whether a "snake-stone," placed on the wound, or medicines applied locally or internally, is simply a piece

of humbug. Some bold men will, however, stand a real bite from a genuine snake (I have seen an instance); they have probably become proof against danger by a process of inoculation with small doses of snake-poison. It must be understood that snake-poison acts in proportion to the dose of it injected into the circulation.

**ERROR XVI.—*There is some general antidote against snake-poison.***

All experiments in this direction have met with utter failure. If successful, they would be of little or no practical use, and they keep up an unhealthy excitement, detrimental to the interests of science.

**ERROR XVII.—*Some animals are either proof against snake-poison, or know of vegetable antidotes against it.***

This is quite erroneous. The only animals proof against the poison of a highly venomous snake are the snake itself, and some other venomous snakes. Snakes of other genera (especially the non-venomous) mostly succumb to its effects.

**ERROR XVIII.—*It is possible to exterminate venomous snakes, or that much good will be done by their systematic destruction.***

This is a fallacy which costs many thousands of pounds annually to the Government of India. The experimental destruction which I carried out has convinced me that one-fourth of the whole Indian revenue would have to be devoted for years to this object before any sensible impression would be made on the snake-population of India. The outcry is of a purely sensational character, got up by well-meaning persons, anxious to extend the police functions of government, but without the faintest knowledge of the impracticability of such a crusade, and the little call for it. As

regards white people, venomous snakes only cause one-tenth the number of deaths caused by dogs. Amongst the black population, the annual loss of life, when reduced to sober death-rates, is really of trifling amount ; it is on the average about one death in 15,000 inhabitants, spread over sixty square miles of country. A tithe of the money wasted on snake destruction would effect sanitary improvements of far greater value than even the extermination of venomous snakes.

This list of errors could be considerably augmented, though it could never be exhaustive, as fresh errors crop up continually. I would, in conclusion, draw attention to the remarkable illustration which this subject affords, of the law of the three intellectual stages formulated by Comte.

#### FIRST OR THEOLOGICAL STAGE.

*Fetish period.*—The venomous snake is a god ; period of simple serpent-worship.

*Polytheist period.*—It now becomes an emblem of various gods or powers—generation, death, eternity, life.

*Monotheist period.*—It is a beast cursed by Heaven, and devoted to destruction.

#### SECOND OR METAPHYSICAL STAGE.

Most of the errors now pointed out belong to this stage.  
In it Lucretius wrote—

Est utique ut serpens hominis contacta salivis  
Disperit ac sese mandendo conficit ipsa.

#### THIRD OR POSITIVE STAGE.

Snakes are examined in connection with the other classes of reptiles ; reasoning and observation take the place of fable and prejudice.

## DESCRIPTION OF THE PLATES.

PLATE I.—*NAGA TRIPUDIANS*, the Cobra.

Fig. 1 & 2.—The gape of the jaws.

- “ 3.—Skin of the head removed, showing the parotid (poison) gland and duct, the maxillary and mandibular saliva-glands, the superficial muscles of the jaws.
- “ 4.—Salivary glands and superficial muscles removed ; the mucous envelope of the fang also dissected off.
- “ 5.—The same, seen from below ; showing principally the muscles which keep the maxilla normally depressed by drawing the pterygoid bone back.
- “ 6, 7, & 8.—Views of the skull.

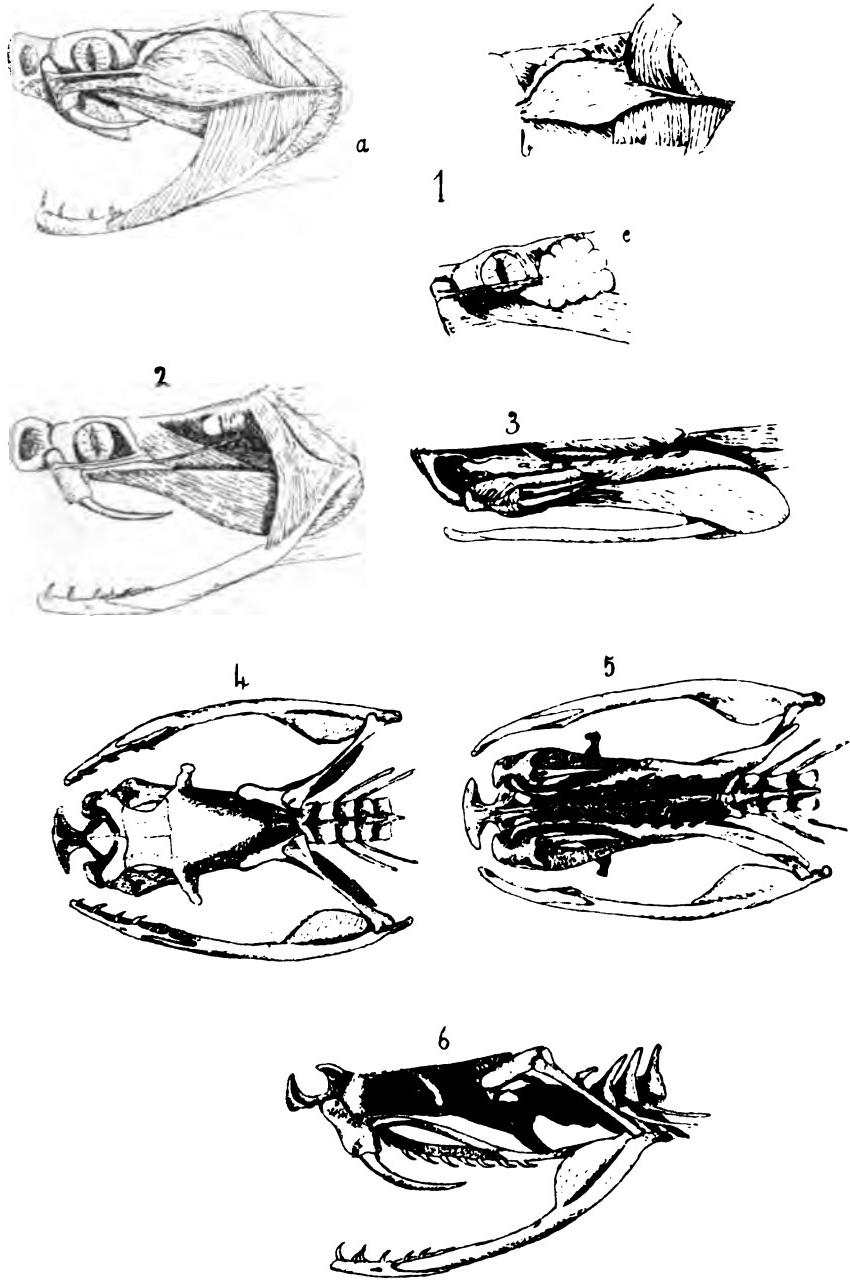
PLATE II.—*DABOIA ELEGANS*, the Chain-viper.

## Progressive Dissections of the Head.

Fig. 1.—a. Skin removed ; b. poison gland exposed ; c. poison gland removed ; lachrymal gland exposed.

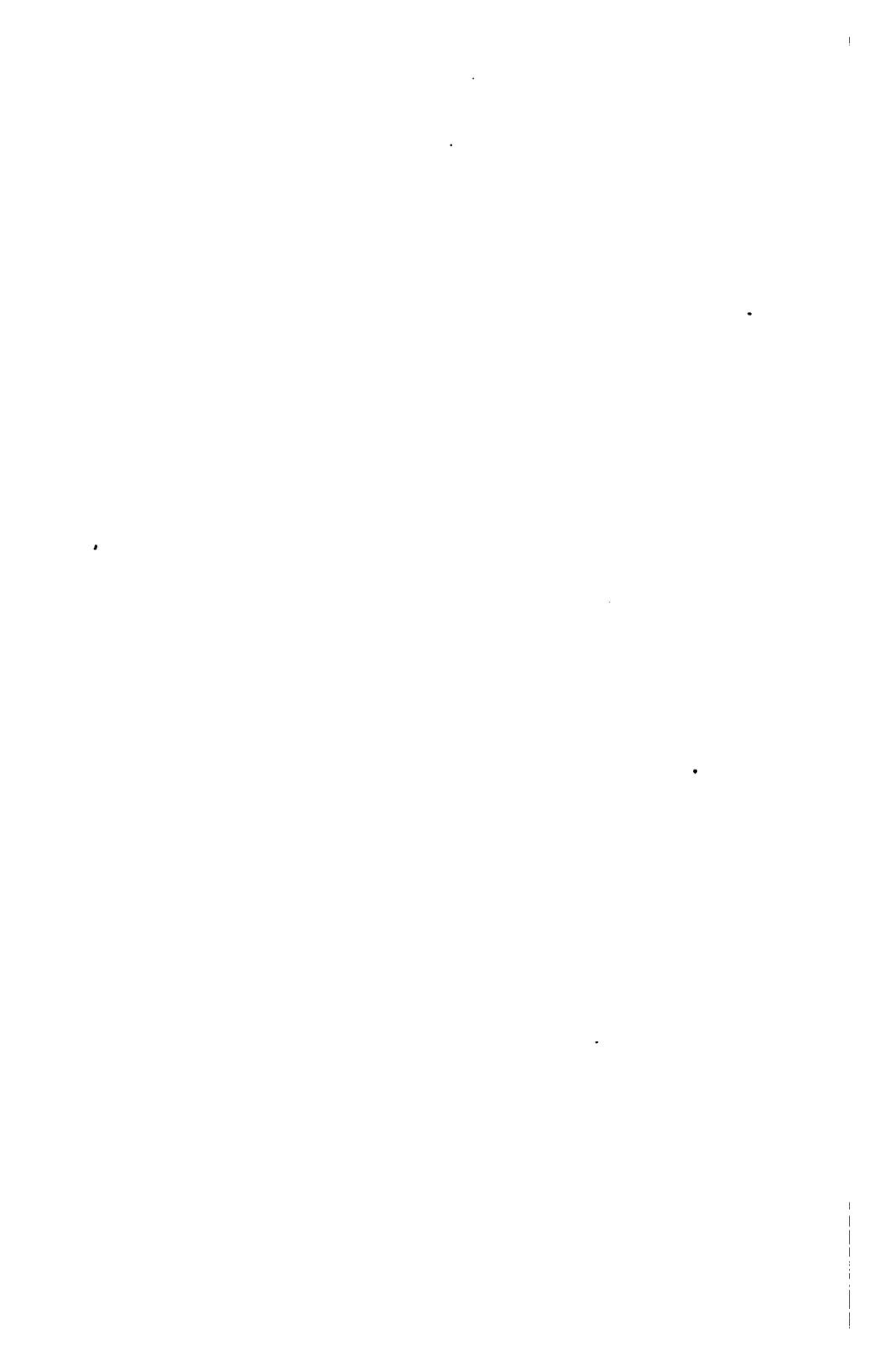
- “ 2.—Gland and superficial muscles removed, showing the deep depressor muscles of the maxilla and pterygoid. The short and high maxilla is seen to be attached at its upper part to the prefrontal and postfrontal bones by the elastic jugal ligament.
- “ 3.—The same from below (right half).
- “ 4.—The skull from above.
- “ 5.—The skull from below ; inner alveoli of the maxille occupied by the mature fang, outer alveoli empty.
- “ 6.—The skull, lateral view ; the pterygoid bone is seen to divide, giving off the tooth-bearing palatine on the inside and the slender ectopterygoid on the outside. The latter abuts against the maxilla below its fulcrum, and, when drawn forward, pushes the maxilla, and causes it (and the long fang it bears) to rotate through a considerable arc ; the fang is thus erected from its normally supine position.

*Note.*—These etchings are printed from the copper-plates on which I recorded my dissections of Indian snakes. They are not to be considered as having been made for purposes of demonstration, yet, from their correctness, I have thought they might be useful to give a general idea of the anatomy of the head of two principal Indian venomous snakes.

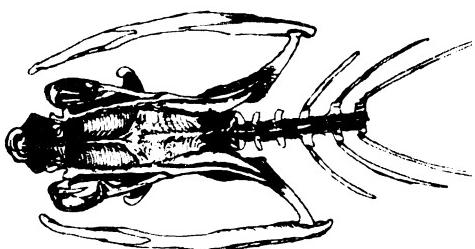
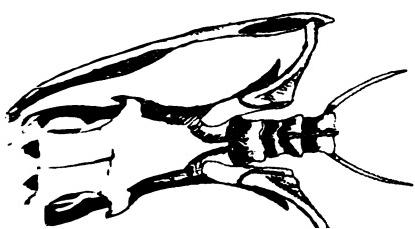
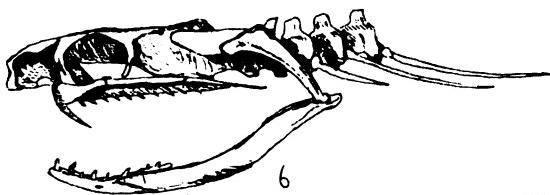
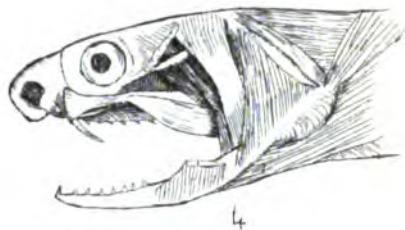
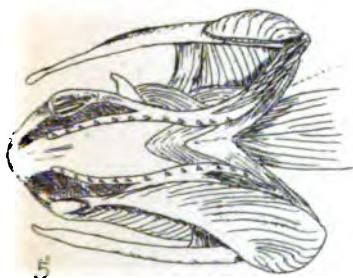
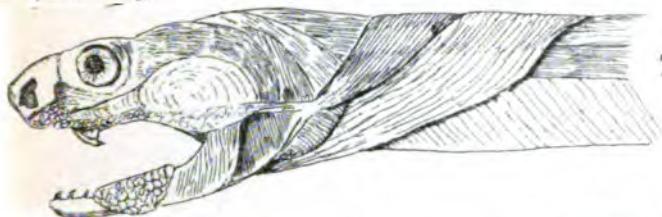
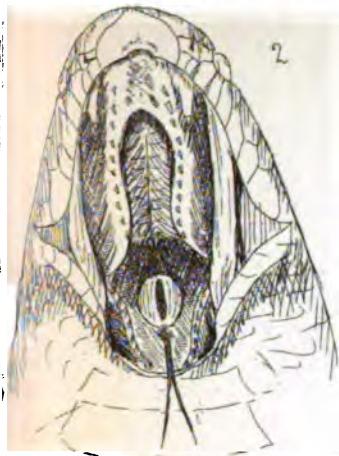


DABOIA ELEGANS.

1, 2, 3, PROGRESSIVE DISSECTIONS OF THE HEAD. 4, 5, 6, THE SKULL



NAGA TRIPUDIANS, THE COBRA.





## A NOTE ON ITACOLUMYTE, OR FLEXIBLE SANDSTONE.

By ALFRED MORGAN.

In investigating the mineralogy of the precious crystals, the "flowers of the mineral kingdom," my interest in that variety of elastic sandstone to which the somewhat fanciful name of Itacolumyte has been given, was awakened. And I have lately found, in the *Records of the Geological Survey of India*,\* a paper by Mr. H. B. Medlicott, A.M., F.G.S., containing fuller information on the nature of this remarkable rock than I had hitherto met with.

It is a prevalent notion that in the Itacolumyte of Brazil we have the true matrix of the diamond. This assertion, which is without proof, has been repeated in many works on gems and precious stones. No authentic instance has yet been produced of its diamondiferous nature, and in India there is not a shadow of such a connexion existing. According to Dana, the Itacolumyte of Brazil, which is associated with gold and topaz, is a micaceous granular quartz rock, which breaks into slabs like gneiss, or mica slate.

In India, the name Itacolumyte has been given to a local and modified condition of a massive quartzite, or metamorphic sandstone. It contains but few and isolated plates of mica, and is devoid of any schistose (foliated) structure. The only known habitat in India of the elastic sandstone is Kaliana, five miles west from Dadri, a small town in the Jheend State, and sixty miles west of Delhi. The hill-systems in the neighbourhood are regarded as prolonga-

tions of the Aravali region of disturbance. The highest part of the ridge that overhangs the village of Kaliana, is double crested, the projecting rocks being two strong beds of ironstone, a quartzite strongly impregnated by massive specular iron (black haematite), and some strings of pure ore, occurring locally with magnetic iron. Colonel McMahon, who communicates the particulars, says, further, that "the ferruginous quartzite is regularly interstratified with mica and hornblende schists, and that an earthy cellular quartzite also occurs, largely used for millstones. All the series are nearly vertical. The elastic sandstone is only found in patches in this band of millstone quartzite. There is no regular bed or seam of it; the stone-cutters, of whom there is quite a colony at Kaliana, come upon it suddenly when cutting out slabs of the ordinary stone. Often the rock in immediate contact with a nest of the elastic sandstone is highly indurated and quartzose. The stone-cutters declare they sometimes find it in the line of the bedding, and sometimes in the joints. Their idea of the matter is, that it is a mere local peculiarity of the sandstone rock, caused by the percolation of rain water and *miti* (earth) from the surface."

It is probable, as Mr. Medlicott observes, that if the *miti* had been omitted, the natives' explanation is the correct one. Superficially examined, the only difference observable is the greater porosity and friability of the elastic stone, as compared with the ordinary quartzite; and the peculiarity of flexibility is probably due to the mechanical removal by water of some thinly permeating cement, to which the strong rigidity of the quartzite is due. The beautiful specimen of the Delhi stone that I exhibit this evening, was presented to the Liverpool Free Public Museum by Mr. Robert Gladstone. It measures 18 inches in length, 8 inches in width, and  $\frac{3}{4}$  of an inch in thickness, and the amount of the deflec-

tion from the plane that it indicates, when supported at each end, is equal to  $1\frac{1}{2}$  inches. There is also a fine specimen of the Brazilian variety in the Free Public Museum. With respect to the quality of flexibility—the stone bends very readily up to a certain point, and then comes to an abrupt stop. Mr. F. R. Mallet\* found that a slab of the Kaliana stone, measuring  $24.5'' \times 6.7'' \times 1.8''$ , resting upon supports  $24''$  apart, gave a deflection of  $0.7''$ , and that, after saturation with water, this amount of deflection was very considerably reduced.

The Brazilian variety has a mottled, greyish appearance, and is of a finer grain than the Kaliana specimen. Its length is  $13\frac{1}{2}''$ , width  $9\frac{1}{2}''$ , and thickness  $\frac{1}{2}''$ . I am indebted to the Committee for kindly lending me the specimens for examination. Professor Haughton thus explains the property of flexibility †—“A most remarkable circumstance sometimes occurs in the formation of these sandstones, which are not composed of pure particles of quartz, but of clay mixed with them, namely, that the particles of quartz mixed in this clay or paste are permitted a certain amount of motion. If you take an ordinary sandstone, it is like any other rock, and with a lens you can see the separate particles, and that each separate particle is touched on every side by a number of other rounded particles that hold it in its place, and it in turn contributes to hold them in their places, so as to form of the whole a rigid rock, like any other. But, occasionally, in some rare cases—which, as far as I have any knowledge of them, are confined to Brazil, South Carolina, and Delhi—you have a rock composed of particles of sandstones, which are not in contact with each other, but lie in a paste of felspathic clay, which clay permits a certain amount of motion between the particles of the mass.”

\* *Op. Cit.*

† *Manual of Geology.* Haughton. Lecture ii., p. 51.

This explanation is quite consistent with the observed phenomena, and Itacolumyte differs from other flexible rocks in the fact that its power of bending is not due to the flexibility of its constituent minerals, but to the existence of spaces round its quartzitic grains, in which a certain amount of motion is possible.

In flexible limestones, etc., the quality is due to the presence of fibres of asbestos, or plates of mica, which hold the particles of the rock together. The question—What is the true matrix of the diamond ? yet remains unanswered ; but all that we know of Itacolumyte dispels the idea that they are in anywise associated.

ON THE METHOD OF CORRECTING THE RATE  
OF A MARINE CHRONOMETER FOR CHANGES  
OF TEMPERATURE, ACCORDING TO MR.  
HARTNUP'S LAWS, WITH TABLES AND  
EXPLANATION FOR FACILITATING THE  
COMPUTATION OF THE SAME CORRECTIONS.

By ARTHUR EDWARD NEVINS.

In the reign of Queen Anne the British Government offered a prize for some method of obtaining the longitude at sea within a certain degree of correctness, which should stand the test of a voyage to the West Indies and back to this country.

A carpenter, named Harrison, invented a watch to compensate for changes of temperature, and submitted it to be tested. Previous to starting on its first voyage he gave it a rate, subject to corrections for changes of temperature. After it had made the first voyage successfully, he again submitted it for trial, but now gave it a uniform rate, and no correction for changes of temperature. The result was fairly successful, but if the extra corrections for changes of temperature had been allowed on the second trial, its performance would have been almost free from error.

It is to be regretted that he disallowed the necessity for these extra corrections, for at present chronometer makers allow no corrections upon the rate given for changes of temperature; and the universal practice at sea is to allow one rate for the voyage, whatever the temperature may be, apparently under the impression that an acknowledgment that such a correction is necessary would be equivalent to acknowledging that the instrument was a defective one.

The present method of compensating a marine chronometer is not absolutely perfect, but still leaves the rate of

the watch subject to variations owing to changes of temperature; and it is the infinite variety in amount and direction of these changes of rate in different watches which causes the instruments on board a ship to differ from each other in the way they so frequently do.

Every good watch is, however, always affected in the same way, and to the same amount, every time that it is exposed to the same temperature, and the changes in watches follow a fixed law; and knowing, from observation, how they perform in certain temperatures, it is possible to calculate in what way they will perform in any other temperature to which they may be exposed.

This law was discovered by Mr. Hartnup, the Astronomer to the Mersey Docks and Harbour Board, as the result of testing upwards of two thousand watches which passed through his hands at the Liverpool Observatory, having been sent there to be tested and supplied with accurate rates. His investigations on this subject commenced in 1844, very soon after the erection of the old Observatory, and he has, at different times, published the results of his observations. In 1871 he laid the laws he had discovered before the Mersey Docks and Harbour Board, in his annual report, together with the formulæ for making the calculations to ascertain the change of rate in a marine chronometer produced by change of temperature.

Mr. Hartnup's laws are the following:—

1st. Every chronometer goes fastest (*i. e.*, gains most or loses least) in some certain temperature, which has to be calculated for each chronometer from the rates that it makes in three fixed temperatures — the temperatures used at the Bidston Observatory for testing watches being  $55^{\circ}$ ,  $70^{\circ}$ , and  $85^{\circ}$  Fahrenheit.

2nd. As the temperature varies, either increasing or decreasing from that in which the watch goes fastest, the

watch goes slower; and its rate varies in the ratio of the square of the distance in degrees of temperature from its maximum gaining temperature.

For example, if a watch goes fastest in temperature  $75^{\circ}$ , it will go slower as the temperature either rises above or falls below  $75^{\circ}$ , and it will go slower by the same amount in any two temperatures that are the same distance from  $75^{\circ}$ , one being above and the other below, as in  $65^{\circ}$  and  $85^{\circ}$ , one being  $10^{\circ}$  below and the other  $10^{\circ}$  above  $75^{\circ}$ .

The importance of a knowledge of these facts in using chronometers is easily seen.

Supposing a ship bound to the southward has three chronometers on board, A, B, and C, and they are all sent to the same chronometer maker to be rated, he gives the rate which these chronometers have kept while in his shop, at a mean temperature of, say,  $60^{\circ}$ . We will further suppose that A goes fastest in  $60^{\circ}$ , B in  $70^{\circ}$ , and C in  $80^{\circ}$ . As the ship gets into warmer weather in approaching the tropics, until she gets into a temperature of  $80^{\circ}$  or more, A gradually goes slower and slower all the time; B goes faster until the temperature rises to  $70^{\circ}$ , and then commences to lose, going slower and slower as the temperature increases more and more; and C goes faster all the time until it reaches  $80^{\circ}$ , which is about as high a steady temperature as will be attained for any length of time out at sea. Now, for these three chronometers to agree in showing the same longitude, it would be necessary for them all to keep steadily to the rates given them in England, or wherever they have been rated; but if they do not keep to these rates, the longitudes indicated by them will differ continually, and, by so doing, cause uncertainty and anxiety to the person using them.

There is another case which may also occur, and which is really more important than the one above mentioned. It may happen, especially if all the chronometers on board are

by the same maker, that they all go fastest in about the same temperature. Now, supposing that all these went fastest in, say,  $80^{\circ}$ , and as in the above-mentioned instance the rates of all of them were obtained in about  $60^{\circ}$  by the chronometer maker, they would all go steadily faster than the rates given as the weather got warmer, and would, therefore, all continue to indicate nearly, or exactly, corresponding longitudes, and these longitudes would all be wrong; but in this case the person using them would feel confidence in his position, and perhaps come to harm unexpectedly.

When the mean rates which a chronometer has made in the three temperatures,  $55^{\circ}$ ,  $70^{\circ}$ , and  $85^{\circ}$ , are known from the Observatory rate sheets, it is necessary to calculate the quantities, C, T, and R, for that watch.

T is the temperature in which the watch attains its maximum gaining rate.

R is the rate at T.

C is a constant factor, which, multiplied by the square of any number of degrees from T, shows the amount of loss for that number of degrees.

It may be here mentioned that C and T have been found by experiment to remain constant for long periods, seldom changing, unless the watch is either cleaned or repaired. R, on the contrary, is liable to change occasionally, and should be verified at every opportunity of obtaining a rate by observation.

Formula for finding C, T, and R.\*

Rate in  $55^{\circ}$  say —  $0^{\circ}72 \dots r$

$$\dots r - r' = - 0^{\circ}45 \dots d$$

$$\text{,, } 70^{\circ} \text{, } - 0^{\circ}27 \dots r' \dots r' - r'' = + 1^{\circ}08 \dots d'$$

$$\text{,, } 85^{\circ} \text{, } - 1^{\circ}35 \dots r'' \\ d - d' = - 1^{\circ}53$$

$$d + d' = + 0^{\circ}68$$

\* Sign + indicates fast error, or gaining rate.

" — " slow " or losing "

To find C

$$C = \frac{2(d - d')}{30^{\circ}} = \frac{-8.06}{900} = -0.0084$$

To find T

$$(T - 70^{\circ}) = \frac{d + d'}{C \times 60} = \frac{+0.68}{-0.204} = -3^{\circ}.1$$

$$T = 70^{\circ} - 3^{\circ}.1 = 66^{\circ}.9$$

$$\text{To find } R \quad (T - 70)^{\circ} \times C = 9.61 \times 0.0084 = 0^{\circ}.08$$

Rate at  $-70^{\circ}$  =  $-0^{\circ}.27$  losing.

Difference to T =  $+0^{\circ}.08$  faster.

R =  $-0^{\circ}.24$  losing.

Let  $\dots N$  = any number of degrees from T.

Then  $C \times N^{\circ}$  = amount of loss for N.

The quantities, C, T, and R, for any watch, having been found, the rule for finding the rate of the same watch in any given temperature is as follows:—

Take the difference between the given temperature and T (calling this difference N).

Multiply  $N^{\circ}$  by C, and the result will be the amount by which the watch will go slower at the given temperature than it does at T; and, therefore, by applying the amount thus obtained to R (the rate of the watch at T), the rate in the given temperature will be obtained.

When C, T, and R have been found, the rate which the watch will keep in various temperatures can be found from the Tables attached.

Table 1 gives the amount by which a watch will go slower than at T, at any given number of degrees from T. The rule for using the Table is:—

Take the difference between the given temperature and T (that is, N).

Take C to the nearest third decimal place. Enter the

Table with C at the head. Enter the column marked N, with N as given to nearest degree, and in the column marked Cor<sup>n</sup> will be found the amount by which the watch will go slower for N degrees.

Example :—

T 72°	C 0·0032	R — 0·54
-------	----------	----------

Required the rate in 60°.

Difference between T and given temperature = 12° = N.

Enter Table headed C 0·003, and column N, and take 12°.

The column headed Cor<sup>n</sup> gives — 0·48 losing.

R — 0·54	—
----------	---

---

Rate in 60°	— 0·97 —
-------------	----------

Tables have been calculated for C 0·001, 0·002, 0·003, 0·004, and 0·005, and for a range of 100° of temperature.

Table 2 is for the same purpose as Table 1, but is so arranged as to avoid the necessity of finding N.

Each of the five sheets is devoted to one value of C, extending from 0·001 to 0·005, which is the range within which every useful watch must have its C. The numbers along the top and bottom of the page are the temperatures in which T may fall ; and the range, taken from 30° to 100°, will include all chronometers fit for the general purposes of navigation.

The numbers at each side of the Table are the temperatures in which it may be necessary to find the rate of the chronometer, and as these numbers extend from 30° F. (below freezing point) to 100° F., they will include all temperatures to which it is likely that the watch will be exposed on a voyage.

The rule for using the Table is—

Enter Table with given C at the head.

Take the T of the watch either from the head or the foot of Table, and take the given temperature in which it is desired

to find the rate of watch from the side column (from the *left* hand side, if T is taken at the *top* of Table, and from the *right* hand, if T is at the *foot* of Table), and where the two lines meet will be found the correction to be applied to R.

Example :—

C 0·003, T 61°, R + 1·54 to find the rate in 78° temperature.

Take C 0·003 at the *head* of the Table, and T 61° in the top line.

Temperature 78° in the *left* hand column, gives Cor<sup>n</sup>. 0·87.

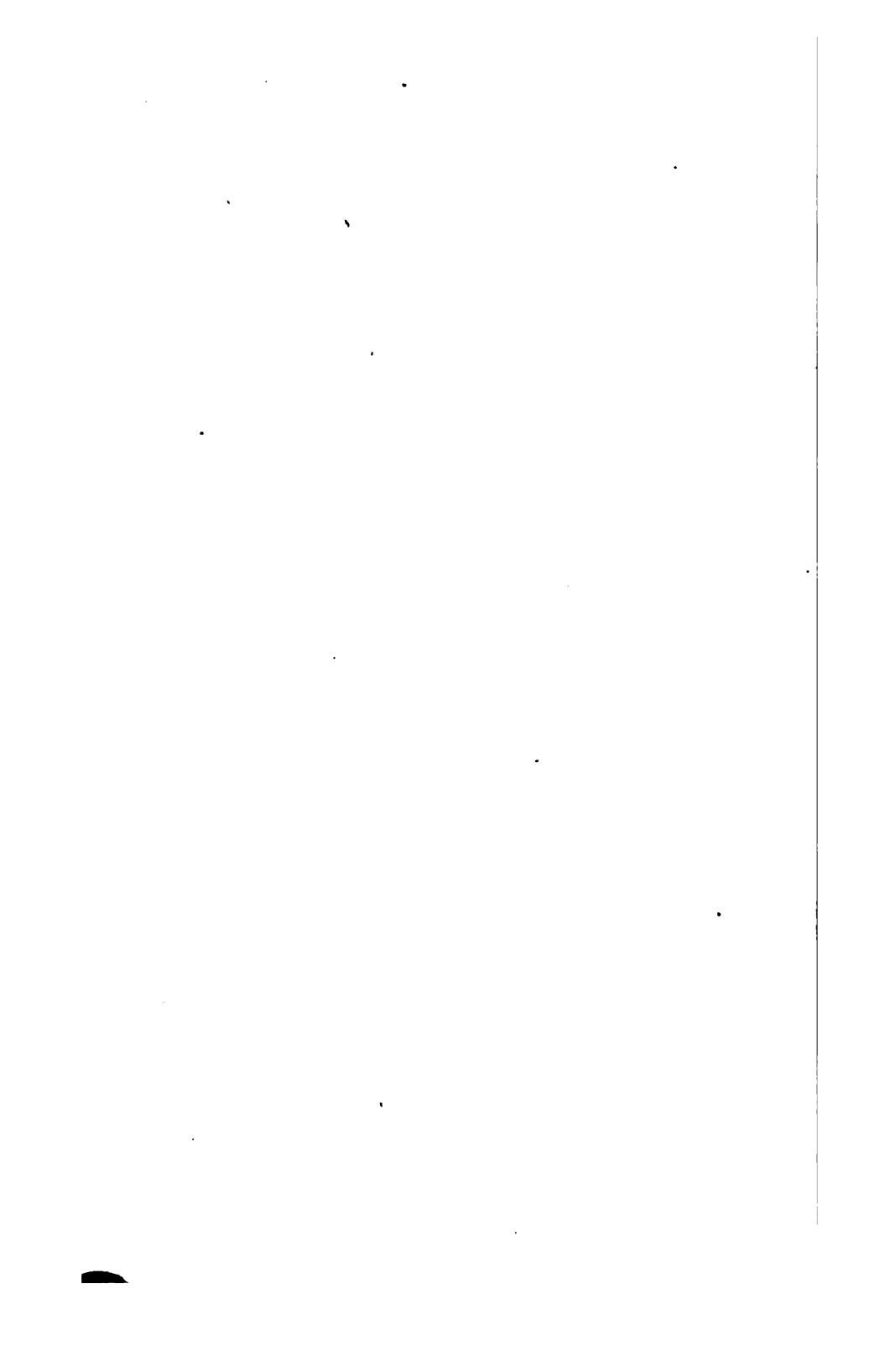
$$\begin{array}{r} R \quad + \quad 1\cdot54 \text{ gaining.} \\ \text{Cor}^n - 0\cdot87 \text{ slower.} \\ \hline \end{array}$$

$$\text{Rate in } 78^\circ + 0\cdot67 \text{ gaining.}$$



ES OF TEMPE

Cor'n..	N.	Cor'n.	
19·68	1	0·00	2
20·17	2	0·02	2
20·67	3	0·04	2
21·17	4	0·06	2
21·68	5	0·10	2
22·19	6	0·14	2
22·71	7	0·20	2
23·23	8	0·26	2
23·76	9	0·32	2
24·30	10	0·40	3
24·84	11	0·48	3
25·39	12	0·58	3
25·95	13	0·68	3
26·4	14	0·78	3
26·95	15	0·90	3
27·46	16	1·02	3
27·97	17	1·16	3
28·38	18	1·30	3
28·89	19	1·44	3
29·40	20	1·60	4
	100		



## ON THE MEN WHO HAVE INFLUENCED MODERN GERMAN THOUGHT.

By BARON LOUIS BENAS.

AMONG the nations that take rank in all that concerns the true civilisation of the present age, the Teutonic race does not occupy the lowest position ; and yet, of all the great human families that have contributed to the vast domain of art, science, literature and philosophy, the German people were the last to achieve prominence. Whilst Spain was revelling in the philosophic lore of her high schools in Cordova, Granada, Toledo, and Sarragossa ; whilst Byzantium treasured up for itself the relics of the classic ages, and the wise men of Constantinople were sought by all the aspiring youth of Europe ; whilst Italy had her poets, painters, lyrics, and historians ; whilst France had her troubadours, minstrels, authors, and philosophers ; aye, and whilst this England of ours had its grand dramatists, poets, and thinkers, Germany possessed not even an intelligible language. These are very strong epithets, but I repeat that Germany did not even possess an intelligible language. A barbarous, rough, uncouth jargon, split into fifty dialects, served for the Teutonic race as a medium of conversation. The Suabian could not understand the Saxon dialect ; the Saxon was totally different to the Hanoverian ; the Hanoverian, again, was unintelligible to the Borussian ; whilst the Borussian was almost a stranger to the dweller of the North Sea borders. As in all early races there were bardic effusions that served for the period as the chronicles of the times, so the Germans had their Meister-sangers, their Minnesängers, their Niebelungenlied,

their *Heldenbuch*, wild compounds of love, war, and romance, such as Macpherson has presented us in the book of *Ossian*; but even these effusions were the offspring of the Suabians, and the seat of the Meister-singers was held in the cities of Mainz, Nuremberg, and Strasburg, where a little of the dulcet sounds of Italy and France could easily be wafted across the borders. Hans Sachs, one of these minstrels, wrote rhyme by the yard, but it contains the merest germs of true poetry.

Germany never took kindly either to Rome or Roman influence; from the days when Varus was defeated by Arminius in the Teutoburg forest, and caused the imperial Augustus to cry, "Varus, Varus, give me back my legions!" to the present day, there has been a continual struggle, both physically and mentally, with Latinism. The Christianity which Boniface preached to the Germans, but which was more effectually introduced by the sword of Charlemagne, had a very loose hold upon the popular mind. The belief in sprites, cobolds, nixes and elves, was everywhere prevalent among the Teutons. Every grove had its geist, every dell was haunted by a fairy, every crag was infested by cobolds, the powers of which were never doubted, but at best thought to be neutralised by a Christian formula, a cross-hilted sword, or a sainted relic; and, as even now in Africa, where the Obeah priest and the medicine man have such powerful influence upon the ignorant multitude, so the reputed witch, for many centuries after the introduction of Christianity, shared with the priest not a little of the popular dread or favour.

Split up, as the Teutonic races were politically, under numerous little potentates, it was impossible for one ruler to make a supreme effort for their regeneration. What was law in one little domain was ostracised in the neighbouring one.

There seems to have been only one common bond of union in all these tribes, and that was hatred of the Walshman. By Walshman was understood those beyond the mountains. All the Latin races were thus classified by the German, the same as our Anglo-Saxons called those beyond their mountains Welshmen, whilst the Welsh themselves know of no such appellation, but style themselves Cymraeg. So the Italians, French, and Spaniards were known to the old Teutons as Welshmen, or Walshers.

It is owing to Martin Luther, in the first instance, that the Germans possess a language.

The writer of this Paper, be it understood, has no predilection for the dogmatic teachings of this heroic man; but if there is any one human being more than another that has deserved well of his country; if there is any one man who has indelibly stamped his high genius upon a whole people, who has tended to make them what they now are, it is undoubtedly Martin Luther. The philosopher, humbly though he may endeavour to deserve that name, dare never allow prejudice to stand between himself and truth; so when the overgrown mosses of fierce hatred and prejudice have been torn away, and all traces of fungus that have clung to the name of this great German have been removed, the rough-hewn statue of the monk of Wittenburg will develop itself as that of one of the greatest literary benefactors of the Teutonic race.

We will drop all reference to the immediate causes of the quarrel of Martin Luther with Rome; but once having seceded, he laboured hard to banish Latin ideas from his people. He successfully accomplished this by his magnificent translation; magnificent, though from a critical point of view not free from error. By this huge labour he crushed at one blow all the uncouth dialects, and established a literary standard of phraseology, known as Hochdeutsch, to

which, however, as we shall show, there was subsequently much refinement and polish added, though from this Hochdeutsch the Germans have never materially deviated. Here at once the man of letters had a common form of expression which was tacitly accepted as a classic one. Luther was aided in his endeavours by the invention of printing, for had it not been for this new discovery, which was almost simultaneous with his time, his efforts might have perished still-born. This naturally caused his writings to penetrate every nook and corner of the dominion, whilst his preaching was only heard by the few. In addition to creating a language for the Germans, he was also a destroyer. He at one blow destroyed the lingering belief in elves, nixes, sprites, and cobolds, and gave the people a substitute in the biblical stories.

Strange as it may appear, whilst the Teutons never would accept much from the Latins, they seized with avidity the stories and psalms and lyrics of the Semitic peasants ; and, whilst nothing of the Latin effusions had ever influenced the national life of the Germans, the writings in what is termed the sacred book permeated and interwove themselves in the daily life and action of the Teuton, until every warrior prated of the sword of the Lord and Gideon ; every heroine called herself a Deborah ; and every orator thought himself a Saul of Tarsus. Luther's versification, though very rugged, adapted itself to the popular tastes ; and, through the chanting of his vigorous and manly hymns, the knowledge of Hochdeutsch and classic German soon became the language of the people.

The Thirty Years' War did much to destroy the germs of literature which were now fairly implanted on Teutonic soil. When mere boys, adults, and grey-haired men had to shoulder a pike, and do battle either for the Kaiser or the Snow-King ; when huge armies traversed and retraversed what were once smiling fields and lovely vineyards ; when

countless villages were destroyed, cities razed to the ground, and huge fortresses levelled to the dust ; when nought was heard but the moaning of the widow, the wailing of the orphan, and famished old men crying for bread, it can well be understood that the last thing to be cultivated would be the gentler muses ; so that, except the German bible and Luther's hymns, there was left nothing but a literary and social chaos. There were still a few feeble attempts, but there was no real giant mind produced until the beginning of the eighteenth century, in 1724, in the person of Immanuel Kant, who, though born and trained in strict and Lutheran principles, by his *Kritic der Reinen Vernunft* has influenced every free university in Germany. It is quite impossible, in the limits of an ordinary paper, to dwell at length upon the theories which Kant has impressed upon the German people, and which, for good or evil, are now strongly influencing the Teutonic mind ; but, to explain briefly, it broke with the school of our Locke, and entirely opposed dogmatic philosophy. Kant's theory is neither the offspring of tradition, sentiment, or experience ; but, based upon pure argument and reason, there is nothing taken for granted except *time* and *space*, and these have to be filled in by the inquirer after truth.

These principles, though in a modified form, were originally introduced to Germany by Benedict Spinoza, who was born in 1632, in Amsterdam, of a family of Spanish Jewish exiles ; when excommunicated from his congregation for his heretical opinions, he conformed to no sect, and, whilst earning his livelihood as a grinder of glasses for telescopes, ushered forth to the world several immortal works, the most important of which is *Ethics Demonstrated Geometrically*.

Of Spinoza it may be said, that he lived so pure, unsullied, and blameless a life, that even his bitterest

enemies, whether they were of the Jewish or Christian conventional orthodoxy, could not, with the exception of his nonconformity, adduce one single fault in the character or virtue of this singularly meek and unobtrusive person. Though courted by the Great Condé, and tempted by the Elector Palatine to occupy a philosophic chair in the university of Heidelberg, he remained independent, and continued his handicraft until his death; and his disinterestedness was also evinced by his refusing a legacy of two thousand guilders, bequeathed to him by an ardent admirer, named Van Vries,—for, being unmarried, he always urged that he wanted nothing.

It is from Kant that Germany has received the philosophy of Spinoza,\* and thus indirectly the latter has driven in the wedge of freedom of thought more firmly, the thin end of which was first implanted by Martin Luther.

A great landmark in German literature was made by Moses Mendelssohn. He did for the German language what Alexander Pope, Addison, and others of that school, did for our own. This man is a living example of how the most obstinate difficulties, that seem almost insurmountable, are overcome by patience and perseverance. He was ushered into the world, so to say, "handicapped" with every conceivable obstacle. He was a Jew, at a period when this was equivalent to being a social pariah. He was, moreover, a cripple from his birth; and his father, a poor scribe or law-writer, could give him naught upon leaving his native town of Dessau for Berlin but his paternal blessing. So great was his poverty, that he relates that when he arrived in the Prussian metropolis, in 1742, he lived upon a turnip

\* In a discussion which followed the reading of the Paper, the Rev. Professor Prag traced the teachings of Spinoza to the writings of Maimonides, a distinguished Jewish philosopher, born at Cordova, in Spain, in 1139.

daily, which he marked so that he might be able to make two meals, and not be tempted to eat the whole. Some time afterwards he obtained a situation as bookkeeper at a silk merchant's, named Bernard, and eventually became a partner in the concern, and rose to be a wealthy man. By the merest chance, he happened, at a book-stall, to purchase an English book, which prompted him to the study of our language ; this eventuated in his becoming an ardent disciple of Locke, and an enthusiastic admirer of Shakespeare. He subsequently taught himself Latin and Greek ; and it is said that such was the capacity of his memory that he could repeat *Virgil* by heart. In 1754, he formed an acquaintance with Lessing, then a young aspirant for literary fame, but at that time quite unknown ; and also, about this period, a prominent bookseller and publisher, named Nicolai ; both Lutherans of the straitest type. The warm friendship of these three persons was only terminated by death ; and to these three persons modern German literature owes a vast debt of gratitude.

At the termination of the Seven Years' War, there was another attempt to Latinise German culture ; and this was brought about by the predilections of Frederick the Great for all that was French and of Gallic tendency. The monarch himself encouraged only French philosophy and literature ; his writings were all in that language, and the only passport to Court favour was by the adoption of French manners. Voltaire, as is known, was a resident in Berlin, and was the bosom friend of the king ; and not only was Voltarianism the prevailing fashion of society, but all the current literature consisted of feeble translations of French authors, and every play produced on the stage was a weak adaptation of some French dramatist.

Mendelssohn, Lessing, and Nicolai, well knowing the

current of popular feeling ran in a contrary direction, set themselves to work to stem the tide of this literary Gallic invasion. Firstly, Moses Mendelssohn strove to euphonise the German language, created new phrases, all of Teutonic origin, but rounded and elegantly finished, so that he was enabled to compete on equal terms with the polish of the French expression. He endeavoured, in his celebrated *Morgen Studen*, or "Morning Hours," to create an epigrammatic style hitherto unknown in Teutonic literature ; and, in order to wean the German people from the teachings of Spinoza and Kant, he wrote his celebrated *Phädon, or the Immortality of the Soul*, wherein he endeavoured to prove that man, after all, has a limit in human reason, and that the sum of everything is not *time* and *space*, but that wise philosophy may be cultivated, with axioms based upon the experiences of past ages. He believed with Tacitus : -

"*Omnia quae nunc vetustissima creduntur nova fuere ; et quod hodie exemplis tuemur inter exempla erit.*"

"All the most ancient things were once new; and what we now defend by example will in future be quoted as an example."

He next threw down the gauntlet to the French literary school, by introducing to the German public, for the first time, the English style of literature and thought, and ran Shakespeare against Racine and Moliere. Here he was greatly assisted by his good friend Lessing, who may be termed the father of the true German drama. Through the persuasion of Moses Mendelssohn, Lessing was induced to create his dramas, not upon French, but upon English models; and, dangerous as was the experiment, it succeeded beyond their most sanguine expectations, and he wrote a series of dramas, such as *Miss Sara Sampson*, *Emilia Galloti*, *Minna Von Barnhelm*, and culminating in *Nathan the Wise*; all founded upon the Shakesperian style, and

these effectually drove away all French adaptations. The play of *Nathan the Wise* is still one of the most favoured representations of the German classic stage. It treats of a very difficult subject, harmony with variations of opinion, the three principal characters being the Sultan Saladin, a Mahomedan ; a Christian Knight Templar ; and Nathan the Wise, a Jew.

Lessing was at one time accused by venomous critics of being a Pagan, with Hellenic tendencies ; but this was admirably refuted by Moses Mendelssohn, who effectually proved, in a splendid *Apologia*, that his friend Lessing, if he did not believe all that the infallible Popes of Lutheranism had propounded, was, notwithstanding, a better Christian, and a truer-hearted German than many of his detractors.

The merits of Nicolai, the third in this trio of friends, must not be forgotten, for, by his practical experience as a publisher and bookseller, he gave the philosophic Mendelssohn and the dramatic Lessing the benefit of his vast experience ; and, in spite of the tempting opportunity of pandering to the influence of the Gallic tendencies of the Court of Potsdam, he continued to foster among the people the love for true German literature, which, though at first gave little hope of gain, eventuated in ultimate pecuniary success.

By this time an enduring taste for all English literature had struck a deep root in German soil, owing to the labours of Schlegel and Tieck, and a host of others, who translated Shakespeare so admirably into the very rhythm and style of the great dramatist himself, that the plays of the bard of Avon were more frequently represented upon the German stage than those of their own native authors. But this had another and an unsought-for tendency, which leads us into the beginning of the present century, and necessitates our making a few reflections upon the pre-nineteenth century and the post-nineteenth century German literature.

Until, say, the close of last century, the poetry, philosophy, and general literature of Germany had only one object and one tendency, namely, the discipline of the mind, the cultivation of the beautiful, and the craving after the unknown.

The invasion of Germany by the great Napoleon, coupled with the influence of the Shakesperian drama upon the public mind, completely revolutionised the tendency of Teutonic literature. Thus the play of *Julius Cæsar* could not be represented without the audience clamouring for liberty. *Coriolanus* was almost the cause of tumultuous riots. *King John*, *Henry V.*, *Richard III.*, and *Henry VIII.*, containing, as these dramas do, strong political allusions, were eagerly taken up by the people, and there was, for the first time, a strong tugging at the political chains which had so long kept the sleeping giant from rising. The two great offsprings of this national feeling were Schiller and Goethe. These poets were the production of what may be termed the school of compromise in Germany. This section, whilst not rejecting the ideas of Spinoza and Kant, allied itself to the teachings of Moses Mendelssohn and Lessing, or rather of the Anglican school; and, whilst searching for the unknown, they would not look upon tradition and sentiment as so much rubbish only obstructing the path of truth; they rather treated tradition and sentiment as crutches, enabling the lame to walk until he might eventually dispense with these aids. But Schiller struck an original path for himself. Fight, if you will, thought he, for the liberty of the mind, but, before all, fight for the liberty of the person. To accomplish this for the German people seems to have been the task of his life.

There existed no Press at that period in Germany, in our modern acceptation of the term, the journals of those days

reporting merely local events, theatrical criticisms, and financial quotations. Leading articles on political occurrences were rigidly forbidden by the Government Censor. There was only one vehicle left for the expression of public opinion, viz., the drama and the stage ; and here Schiller unfolded to the mind a lavish profusion of grand historical pictures.

His *Don Carlos* roused the people to fury by the depiction of the incapable Philip II. of Spain, who frittered away the grand resources of a noble people. His *Cabale und Liebe*, "Love and Intrigue," stung like an adder at the petty intrigues of the German microscopic principalities, and dealt "caste" a reeling blow. The *Maid of Orleans* gave the Germans new hopes of political regeneration. His *Maria Stuart*, *The Death of Wallenstein*, and *The Conspiracy of Fiesco*, all written with a purpose, culminated in his *Wilhelm Tell*, one of the few perfect dramas that exist.

It is here that he throws his whole soul into the work of the political resurrection of his country, veiled, of course, by a semblance of Swiss independence ; and his last lesson to the German people is given in these words of Attinghausen, who, when dying, mutters :— "Cling ye one to another, firm and for ever ! Let no free city be a stranger to another. Preach it high upon your mountains, that all your States shall quickly join as one. I charge ye, Unite, unite, unite !"

No one can describe the effect upon the German people of those last words, "Seyd einig, einig, einig !"

I remember, in 1861, the first time I ever visited Germany, seeing *William Tell* represented in the Berlin "Opernhaus," when the whole audience sprang to their feet, and shouted "We will, we will !"

As Englishmen, we who have enjoyed constitutional freedom so long cannot imagine its effect ; and, without

doubt, the possession of the long-wished-for unity by the German people will eventually weaken the force of this sentiment, even with them.

Goethe was, without doubt, from a philosophic point of view, the superior of Schiller; though the latter was much more national in his feelings, still Goethe, by his *Egmont*, a drama depicting the rising in the Netherlands, materially aided the cause of political literature; but Goethe was much too *vielseitig*, as the Germans would call it, that is, many sided—he touched upon the whole range of human wisdom—to have been a truly political writer. His *Faust*, the great masterpiece of poetic literature, is even now a vast riddle which every one solves after his own particular mode of thought. I would venture to believe that it was written as a compromise between the philosophy of Spinoza and Kant, and traditional and conventional orthodoxy. Faust yearns for the unknown, has sacrificed every earthly pleasure for the one unattainable object. The mind of Faust, encased within the frail human frame, succumbs to that which is earthly and natural. A girl, Gretchen, and rejuvenation, is the exchange he receives for aimless philosophy. Faust, safe in his early career of isolation, now runs riot, and is lost by contact with the world and things worldly, his old philosophy availing him nought when brought face to face with daily life; he is only saved in the end from utter misery by the conventional orthodoxy of Gretchen, upon whom he leans rather than follows. The last words of Faust are most suggestive—

“ Im vorgefühl von solchem hohen Glück  
Genieß ich jetzt den höchsten Augenblick.”

“ In the mere hope of eternal bliss  
I now feel eternal bliss indeed.”

I dare not mention a tithe of the many illustrious names

that have adorned the Valhalla of German literature and philosophy. I must pass Fichte, Hegel, Schelling, Herder, Humboldt, Varnhagen Von Ense, and many others, confining myself only to the leaders and not their followers, and now proceed to treat upon the newest and latest phase in Teutonic thought.

When the great Napoleon was vanquished, and the German people returned to their homes, after having fought and bled for the independence of their country, they awoke to find themselves the victims of a terrible delusion. After all their sacrifices, the net result to the people seemed to be increased taxation and a change of masters, a prince bearing a German instead of a French name. The various kings, grand dukes and other princelets combined among themselves, and, scared by the nightmare of revolution, strove to repress every symptom of free thought; and a curious alliance took place, from 1815 to 1830, between the Ultramontanes and the teachers of extreme Lutheranism, and prompted the governments to banish and proscribe all ideas that were at variance with strict legitimacy or orthodoxy. England was cited as a wretched, unfortunate country, without the moral courage to rid itself of that odious constitutional system which must eventually swallow it up in a whirlpool of revolution and terror.

Naturally, a violent reaction took place against the teachings of this system, which was mainly fostered among the students in the various Universities; they formed themselves into clubs, called Burschenschaften, or Boyships, and strove to the utmost to combat the formal piety which was at that period the prevailing tone of good society.

That happy compromise which had been inaugurated by Schiller and Goethe was thrown to the winds, and the ethics of Spinoza and the teaching of Kant came to the forefront again; indeed, by many intelligent minds, it began to be

discussed whether Napoleon was the great monster of evil that their rulers had taught them to believe ; and the thought entered their minds, and not unjustly, that the overthrow of many abuses and antiquated and useless institutions was not a little due to the influence of this child of the French Revolution, and that this great upheaving of modern society, like the rising of the Nile, which, for the time being, carried havoc and destruction in its course, had, notwithstanding, left sufficient fertilising material in its train to compensate them for their temporary troubles and losses. There was just a little hankering again after Latinism. Every student spoke of Cato and of Cicero and Brutus, when again a saviour appeared to the Teutonic philosophic and political world in the person of Henry Heine.

If you ask a young German to-day which is his favourite author, he will tell you Henry Heine. Ask the mature German, who has contributed most to forming his ideas, most probably he will say Heine. Ask a German matron, whose ballads please her most, and you will elicit the name of Heine. And if you see a coy maiden emerge with a book from her boudoir, and with her eyes half suffused with tears, it is more than probable that Heine's verses have been the cause of her distress. It would be difficult to compare Henry Heine with any one of our English authors, but he might be defined as possessing the peculiarities of three of our distinguished men ; he is very much of a Byron, a little more of Macaulay, with a dash of Tom Hood the elder. To him Germany largely owes her present literary and political independence ; aye, even as much as to the redoubtable Bismarck and Moltke.

One of Heine's English critics, Edgar Alfred Bowring, says : "Comparatively little known and little appreciated in England, the name of Heine is in Germany familiar as a household word, and while on the one hand many of his

charming poems have become dear to the hearts of thousands and tens of thousands of his fellow countrymen, and are sung alike in the palace and the cottage, in the country and in the town, on the other hand his sterner works have done much to influence the political and religious tendencies of the modern German school."

Thus far the critic, who is accurate in every word.

Crossed in his affections in early life, while yet in his teens he wrote songs, as he says, to sing that he might not weep. Or, in his own words—

On my life, a life of darkness,  
Once a vision sweet shone bright,  
Since that vision sweet hath faded  
I 'm now veil'd in utter night.

When in darkness children wander,  
Soon their spirits die away,  
And to overcome their terror  
Some loud song straight carol they.

I, a foolish child, am singing  
In the dark that 's spread around :  
Though my song may give no pleasure,  
Yet mine anguish it hath drowned.

Heine's principal weapon lay, however, in his satire—a satire that spared neither rank nor degree—and much as it is to be deplored, it spared not that which men hold most sacred; it was the natural reaction of the pietism and hypocrisy which was predominant after the Napoleonic wars.

*The Grenadiers* is as popular in France as in Germany; I give it you in its English guise—

Two grenadiers travelled towards France one day,  
On leaving their prison in Russia,  
And sadly they hung their heads in dismay  
When they reached the frontier of Prussia.

For there they first heard the story of woe,  
That France had utterly perished,  
The grand army had met with an overthrow,  
They had captured their emperor cherished.

Then both of the grenadiers wept full sore  
At hearing the terrible story,  
And one of them said, Alas! once more  
My wounds are bleeding and gory.

The other one said, The dream 's at an end,  
With thee I would die right gladly,  
But I 've wife and child at home I must tend,  
For without me they 'd fare but badly.

What matters my child, what matters my wife,  
A heavier care has arisen,  
Let them beg, if they 're hungry, all their life,  
My emperor sighs in a prison.

Dear brother, pray grant me this one last prayer,  
If my hours I now must number,  
O take my corpse to my country fair,  
That there it may peacefully slumber.

The legion of honour, with ribbon red,  
Upon my bosom place thou,  
And put in my arm my musket dread,  
And my sword around me brace thou.

And so in my grave will I silently lie,  
And watch like a guard o'er the forces,  
Until the roaring of cannon hear I,  
And the trampling of neighing horses.

My emperor then will ride o'er my grave,  
While the swords glitter brightly and rattle,  
Then armed to the teeth will I rise from the grave,  
For my emperor hastening to battle.

With pardonable egotism he used to say he was the first man of this century, as he was born on January 1st, 1800.

Heine's mode of treating Germany was similar to that, if I may use a homely simile, of a boy with a whipping-top ; he lashed Germany until he made it spin, or, like a physician, he used such strong counter-irritants so as to bring the evil to the surface. He would taunt the German, in prose and poetry, that Britain ruled supreme on the wave, France upon the land, whilst Germany held undisputed sway over the clouds. Whilst, he said, England loved liberty like a wife, possessing it, loving it, and cherishing it, France loved liberty like a sweetheart, always coquetting, yet never wedding, whilst Germany loved liberty like her old grandmother.

His terrible and withering sarcasm upon the petty princes in Germany, and upon the cloudy policy of Frederick William IV. of Prussia, caused an order for his arrest, but, being warned from a friendly source high in favour at court, he escaped to France, where he resided until his death. When taunted by his opponents with his flight, he retorted that all distinguished men fled once in their lives. He said that Moses fled from Egypt ; Jesus fled with his parents from Palestine ; Mahomet fled to Medina ; Henry Heine fled to Paris ; and, to cap all, the great king of Prussia and his whole army fled from Napoleon at Jena.

From Paris he launched his thunderbolts against all that was effete and rotten in the old Germanic system. His influence with the German people was positively unbounded. The *Augsburg Gazette*, to which he contributed articles, caused a vibration throughout the whole empire.

In a magnificent poem, entitled *Germany*, he thus addresses the king—

O king, I really wish thee well,  
When this advice to thee I 'm giving ;  
Due reverence pay to poets dead,  
But tender be to the living.

Affront the living poets not,  
With weapons and flames they are furnished,  
More terrible far than the lightnings of Jove,  
By the poets created and burnished.

Is Dante's hell to thee unknown,  
With its terrible trinary verses ?  
The man whom the poet has there shut up,  
Will never escape from his curses.

When Louis, king of Bavaria, built the celebrated Valhalla in Munich, he placed therein the statues of all German worthies; from Teut, the founder of the Teutons, to Schinderhannes, the celebrated brigand; but, being a good son of the church, he would not include Martin Luther. In a poem, directed to king Louis, Heine has this verse—

But Luther, the blockhead amongst them all,  
Has no place in this proud mausoleum ;  
The whale 'mongst fishes is often left out  
In a natural history museum.

It is much to be deplored that the great influence which Heine exercised upon the German mind, brought with it also a spirit of doubt in all tradition, whether sacred or otherwise. Indeed, Heine called himself a Greek and a Pagan, though during the eight last years of his life, when he was confined to a bed of sickness, he employed most of his time in reading the Scriptures.

Of his beloved fatherland he writes—

Beauteous cradle of my sorrow,  
Beauteous grave of all my peace,  
Beauteous land, we part to-morrow,  
Fare-thee-well, our ties must cease.

Fare-thee-well, thou threshold holy,  
Where my loved one sets her feet ;  
Fare-thee-well, thou spot so holy,  
Where we chanced at first to meet.

And my limbs in wanderings dreary,  
Sadly drag I full of gloom,  
Till I lay my head, all weary,  
In a chilly, distant tomb.

And of himself he mournfully utters—

Not one mass will e'er be chanted,  
Not one Hebrew prayer be muttered ;  
When the day I died returneth,  
Nothing will be sung or uttered.

Some of Heine's political prophecies are truly remarkable, such as his description, in a minutely exact manner, of the probable fall of Louis Philippe and his escape to England, written some ten years before the event took place ; also his forecast of the destruction of the Vendome Column by the Communists ; also the taunt, when the Parisian fortifications were being built by Louis Philippe, that they would be a stone shroud to beleaguered Paris, and would be the means of her starvation, not as the French thought, their salvation ; he also predicted that the first war between France and Germany would eventuate in the loss to the French of Alsace and Lorraine ;\* he also foreshadowed a circumstance which has not yet been fulfilled,—he says, “ Poor Napoleon, well had it been for thee had thy people allowed thee to slumber peacefully in St. Helena's Isle ; the English would never have disturbed thee. Once let Communism get fairly hold of France, and they will take thy ashes from the Invalides and throw them into the Seine, as a vain-glorious tribute to universal brotherhood.”

\* Heine died in 1855, long before the Franco-Prussian war was ever dreamt of.

If we pass in review all the great minds that Germany has produced—and they are not a few—none have influenced the latest phase of German thought to a greater extent than the poet Henry Heine.

Whether Heine was ever reconciled to traditional belief remains unsettled to this day. I venture to think he *was*. Among his last verses, written shortly before his death, are these—

The body to poor soul replied,  
Cheer up, be not dissatisfied,  
We peacefully must learn to bear  
What Fate apportions as our share.  
I was the lamp's wick, I must now  
Consume away; the spirit thou  
Wilt be selected by-and-by,  
To sparkle as a star on high  
Of purest radiance. I 'm but rags,  
Mere stuff, like rotten tinder bags,  
Collapsing fast, and nothing worth,  
Becoming what I was—mere earth.

\* \* \* \* \*

There is a little mound of earth in the cemetery of Pere la Chaise containing all that was mortal of Henry Heine. Germans visiting Paris, make a pilgrimage to this spot. Even strong, sturdy men are not ashamed of a tear, and why should they be, for does not that hallowed ground contain one of the men who made their German Empire?

## ON SOME TABLETS FOUND IN EASTER ISLAND.

By J. LINTON PALMER, F.S.A., F.R.G.S., R.N.

In a Paper I had the honour of reading to this Society last year, *On Easter Island*, I mentioned that, among other curious relics found, there were some small tablets of hard wood, incised with symbols whose meaning was unknown; and I stated that I was taking steps to assure myself of the truth of various reports concerning them. As many members now here may not then have been present, may I be allowed to give a short account of these things, of whose appearance the casts and photographs on the table convey a fair representation.

There are but eight of these tablets now known. Four are in Tahiti; two in Chile; two in Russia.

The first three were obtained by the Chilian exploring expedition of 1870, of which one was lost on its passage to France. They were found in the half-underground stone-houses, near the Great Crater. We are told that, in 1864, they were common enough, but that most of them were destroyed after the coming of the Missionaries. Strangely enough, we have not yet met with similar tablets in any of the various groups of islands in the South Seas.

The tablets, as you see, are grooved into shallow channels. In them are incised figures and symbols; some very grotesque; some seemingly copies of such objects as birds, fish, eggs, &c.; some are compounded of these and an arbitrary mark; some seem simple arbitrary marks. We are told by the first Missionary that each symbol had its own signification (*nombre*), and that they were still copied by the

natives, many of whom had forgotten their primary meaning; and, again, that but little importance was attached to these tablets.

The characters in the grooves are reversed, cut upside down in every alternate line, so as to prevent confusion in reading them. This method is called *Boustrophedon*, and was used by various ancient nations, *e.g.*, the Greeks. Instances occur, also, among the Himyaritic inscriptions lately found in South Arabia. They seem also to be divided into paragraphs by a vertical line of half-a-dozen nicks.

No sooner had these casts arrived in England than several savants began the task of trying to decipher them. Of these, Mr. Park Harrison seems the most zealous. He has read two Papers (now on the table) about them, before the Anthropological Institute. As, however, he had no Rosetta stone, so to say, by which to correct his suppositions, his attempts do not seem to have had the success they merited; and I must confess that my eyes do not see the symbols as he describes them. I have not been able to find out whether anything to this end has been done on the Continent, whither some of the casts were also sent from Chile.

Mr. Croft, who lately resided at Tahiti, sent photographs of the four tablets there hither and thither; but I have not heard that he made any researches into their meaning, though he says he found a native who could read them, and that they were about the religion, land-tenure, history, &c., of the islanders.\*

By the last mail I received from our Consul-General at

\* In Mr. Harrison's last Paper, we read:—"An Easter Islander in Tahiti professed to be able to read the tablet, but was unable to do so. He had partially learnt to do so, but would only say the signs stood for ideas and sentences." Mr. H. sent photographs of the cast of a tablet, now in Chile, to Tahiti, and found, in a letter sent in reply, that the tablet is "one of those which says a good deal about their chiefs," and that some explanations he offered were correct.

Tahiti, in answer to my queries, a letter, four photographs, and a notice, which, though brief, is of great interest.

The Notice is from Monsignor Tepano Jaussen, Bishop of Axieri, Vicar Apostolic of Tahiti. It contains the following details :—

Of the four tablets in the Roman Catholic Mission at Tahiti—

One contains 1547 characters in 16 lines.

Another "	1135	"	"	22	"
-----------	------	---	---	----	---

" "	822	"	"	17	"
-----	-----	---	---	----	---

The fourth	806	"	"	28	"
------------	-----	---	---	----	---

In these	4310	"			
----------	------	---	--	--	--

The sign for Earth occurs 362 times.

" for Sky or Heaven	occurs	115	times.
---------------------	--------	-----	--------

" for Man	"	454	"
-----------	---	-----	---

" for Bird	"	261	"
------------	---	-----	---

The following is an extract from the letter of Consul-General George Miller :—

" Monsignor, some time since, assisted by some of the Easter Islanders now in Tahiti, undertook the task of endeavouring to decipher these characters, and has filled a considerable number of sheets with the notes of his, as yet, unfinished work—now laid aside for awhile, but which he intends to resume at some future opportunity—intending eventually to publish the results in the periodical of his own Society, the *Picpus*, which, he frankly says, he wishes to have the benefit of first giving publicity to the fruit of his labours. Hence the brevity of the notice. But he has, however, expressed, more than once, his decided opinion that the tablets record nothing of importance, and that, though the characters inscribed on them may be of ancient origin, yet the work itself is modern, and relates nothing, he is convinced, beyond the stories of a child-like ignorant people.

"It would seem that, in certain districts of Easter Island, 'wise men' taught the art of reading or reciting from these tablets, some of which may still be found preserved among the few remaining inhabitants left on the island. Those of them who were brought to Tahiti included among their number some who said they could read this picture-writing; and some have chanted or recited to the Bishop from his tablets little tales of the simplest kind, such, in fact, as these islanders might be expected to be capable of producing."

This is the sum of the communication; and let us hope that the labours of Monsignor will soon be published. If the "simple tales" mentioned are but the folk-lore of the islanders, they will yet be acquisitions. How much labour has not the late Dr. Bleek expended on the folk-lore of the Bushmen? How much exertion has not been used to collect that of other nations and tribes?

It may be that these tablets are only the "Horn-books," and we may yet obtain those of the records.

I show some of these incised characters, enlarged, to give an idea of the apparent hopelessness of attempts to decipher their meaning without an accompanying translation of the contents of one tablet into some known character; nor will this be the less apparent when we consider other circumstances attending the use of *hieroglyphics*, as this style of communicating ideas is called.

We have, as you know, but two methods by which we usually communicate or interchange our ideas:—

1st. By sound—Music.

Articulate speech.

2nd. By sight—Gesture.

Symbol.

I omit the technical mode used for the blind.

1st, Music.—If you think this far-fetched, may I tell you that, when I was in the Sandwich Islands, 1851–52, there was in use among the natives a kind of Jew's harp, made of wood, and strung like a small bow. This was played on by the mouth and fingers ; and a young couple, seated on either side of a ravine or small valley, would, by the tones of this instrument, communicate their ideas one to the other. Its use was found to be so sensational, and to lead to so much waste of time (to say the least) by courting, that the practice had to be suppressed by the Missionaries. The same practice existed in the Marquesas Islands. So it is not the only instance of "Lieder ohne Wörte"; and you will find, in one of the prettiest of the Polynesian legends—that of *Hine-moa*—told by Sir G. Grey, in his *Mythology* (p. 233), how, in a similar case, the hero "Poured through the mellow horn his plaintive soul."

Speech and Gesture require no comment.

2nd, Symbol, may be divided into—

Picture-writing.

Hieroglyphs.

Character-writing.

#### *Picture-writing.*

Picture-writing is found to have been used over all the known world, Old and New.

1. Strahlenberg tells us that in many parts of Siberia are to be found rocks covered with picture-writing.

2. Charlevoix tells us how the various tribes of North American Indians sent news and tidings, as well as keeping their current history, by skins and pieces of bark and wood, on which figures were painted. I think you will find this mentioned also by Catlin and others.

3. Humboldt describes, in his *Ansichten*, the sculptured rocks found in the valleys of the rivers Orinoco and Cassi-

quiare (the Piedras Pintadas of Hortsman), on which are incised figures of wild and domestic animals, snakes and other reptiles, birds, etc., and gives the tradition of the present natives as to the people who engraved them. They extend over a district of 200,000 square miles, nearly 8° of longitude.

4. Sir R. Schomburck tells us of similar inscriptions near the river Essequibo, in British Guiana, and that they are so numerous and well done as to merit the attention of future travellers.

5. In Mexico, where this mode was far advanced, from the people being so civilised, not only were copies put of those things which had bodily shape, but also arbitrary marks for things abstract, or having no determinate form, as the air.

6. In the Friendly Islands was found the painted cloth (tappa) I spoke of, which was brought to England by Captain King, the companion of Captain Cook, in which Mr. Astle traced resemblances to the figures of the Mexican picture-writing.

7. In Europe, certain Hungarian inn-keepers kept their accounts in this method, not only of the amount owed by the debtor, but also of his quality or occupation, as by putting a sword to represent a soldier, a whip for a carter, and so on.

### *Hieroglyphs.*

Hieroglyphs, properly understood as such, are the ideographs which were used by the ancient Egyptians, their system making a very perfect method, of which I will give as brief an account as I can.

The signs employed are divided into three classes.

Simple or Natural Ideograms.

Generic or Determinative Ideograms.

Phonetic Ideograms.

*Simple Ideograms.*

Pure Pictures,	or copies, make the If we wish to describe a	Mimic signs	a Cow	is Cow.
Quality,	employing metaphor, we put	Tropic or Converted signs.	Red Bird	for Red.
Attribute.			Jackal	for Wise Priest.
Emotion.	If we wish to express action we put		Ape upright	Anger.
Cause for effect or <i>vice versa.</i>	To prevent multipli- cation of signs (by Synechdoche) we put	Contracted signs.	Hand Plough Eye Pool Bunch of Reeds A Bird's Head Pupil of Eye Ibis Enigmatic or obscure signs.	Digging. Seeing. River Nile. Lower Egypt. for Birds. for Eyes. for god Thoth. for god Typhon.
	Generally used for Divinities,		Seated Ass.	

*Phonetic or Cyriologic Ideograms.*

In these, a word is spelt by taking in succession the initial letters of the names of various objects. So that any name, form, or abstract idea may be rendered by the sound of the group.

For example, an ash-tree.

A, an ant; S, a swallow; H, a hog.

But, as this may be quite misunderstood by reading pig for hog, to ensure it is a tree and not a serpent we are talking of, we append its generic sign.

*Generic or Determinative Ideograms.*

These signs, determinative (of sound), as Bunsen calls them, are modifications of the tropic or converted signs. They are about two hundred in number, and in that respect resemble the Chinese Radical characters. They always follow the group which gives the special idea; so every perfect word consists of this combination.

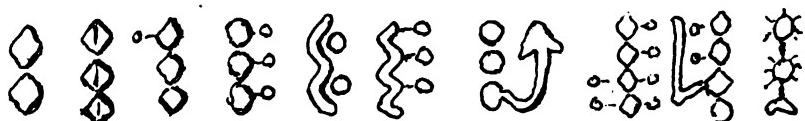
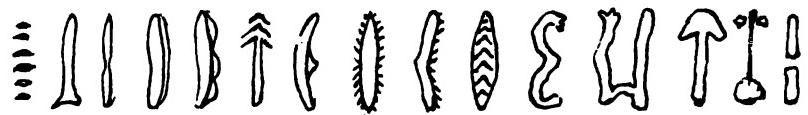
For example, the determinative for skin is appended to the phonetic group signifying skin; leather, anything made of either; and, lastly, by amplification to animal, several kinds of animals.

From the foregoing, it is evident that mistakes without number may be made in endeavours to translate without a standard to refer to. And you may ask, Why waste so much time on so dry-as-dust a subject? But is it so? as we find that these systems have been so universally used as an exponent of human thought and history. Who can assure us that some valuable kernel may not be found in this hard and uninviting nut?

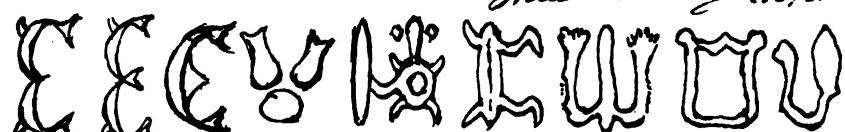
I must apologise for so long trespassing on your time and attention. My only excuse is—

“Homo sum  
Humani nihil a me alienum puto.”





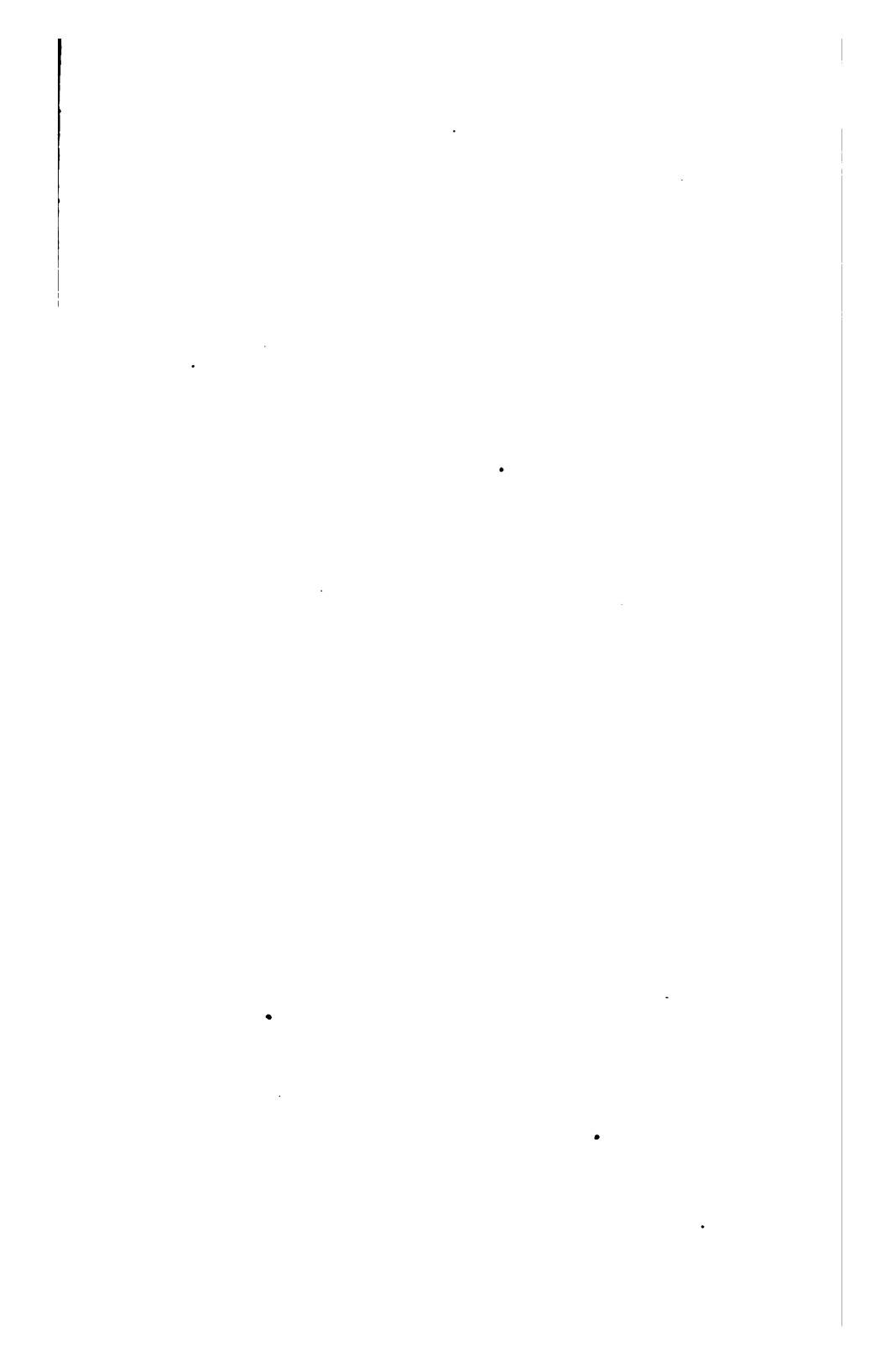
Hinton Palmyra - 1876.



In the Plate I have delineated a number of the symbols inscribed on the tablets, about the same size as the originals, and taken indifferently from the casts and photographs. I have not copied all the simple forms, and, of course, there are many more compound signs.

A constant figure in the casts is the one like fig. 2, line 4, clasping a post or pillar. Fig. 3, line 2, has often four little fins, like turtles' flippers, appended. The first figure, first line, seems to divide the contents into sentences. Sometimes two or three similar figures are joined together in line, as in the case of the hawk-headed figure.

There is considerable difference, also, in the size, finish, and execution of the originals in the various tablets.



## THE HOUSE OF STANLEY AND THE LEGEND OF THE EAGLE AND CHILD.

BY JAMES A. PICTON, F.S.A.

STUDENTS of history have come at last to recognise the supreme importance of consulting contemporary documents, where such exist. Without this, history is reduced to the condition of an idle romance, or a vehicle for party prejudice. I propose to illustrate this principle by reference to a little episode of English history bearing upon a family illustrious in the annals of our peerage, and never more so than at the present time.

The Chetham Society have recently issued a volume of Lancashire Inquisitions in the thirteenth and fourteenth centuries, from the Towneley and Dodsworth Collections. The information afforded as to the state of society at that period is curious and valuable. The documents are of the highest authority, being returns to writs from the Crown on evidence, on oath, before juries or commissions, in respect to the property of feoffees of the Crown or Duchy of Lancaster. Several of them refer to the family of Lathom, and the Stanleys their successors, at their first emergence into notice in the reign of Richard II.

The rise of the Stanley family has a legendary history attached to it. This is fully set forth in the *History of the House of Stanley*, by John Seacome, 1741. The original legend runs as follows: Sir Thomas de Lathom, early in the fourteenth century, walking with his Lady, who was childless, in his park, drew near to a desert and wild situation, where it was commonly reported an eagle built her nest, and,

upon their near approach thereto, heard the cries of a young child, which was found by their servants in the nest, being a male infant dressed in rich swaddling clothes. And they, having no male issue, looked upon this child as a present sent from heaven. They took it under their protection, had it carefully nursed, and baptised by their own name. The child became their heir, and at his death left an only daughter named Isabel, whom Sir John Stanley married, and, in memory of this event, took the eagle and child for his crest, as since used by his noble successors the Earls of Derby.

The legend, as modified by Seacome, commences with Sir Thomas de Lathom, who lived in the reign of Edward III.; that he and his lady being highly advanced in years, without any issue but one daughter, and he being desirous of male issue, but despairing thereof by his own lady, had a love intrigue with a young gentlewoman of his acquaintance, who bore him a son, whereof he was greatly rejoiced; but the difficulty arose how to introduce this young scion without inducing domestic strife. After several schemes and proposals, they hit upon the expedient of placing the child, richly dressed, in the vicinity of an eagle's nest, where it was found by the servants, and received by the lady with kindness and affection. The child was baptised by the name of Oskatell de Lathom, his mother's name being Mary Oskatell. The youth did not ultimately succeed to the family estates, which descended to Isabella, Lady de Stanley; but he was portioned off with certain manors at Irlam and Urmston, near Manchester, and other lands in Cheshire. Sir Thomas, in memory of the event, is stated to have assumed for his crest an eagle upon wing regardant, and that the Stanleys, despising Oskatell and his pretensions, took upon them the eagle and child in token of contempt of his claims.

The legend, whichever form be adopted, presents absurdity on its face. The eagle bearing a shield, emblazoned or, on a chief indented az. three bezants, is found on a seal of the father of the Sir Thomas to whom the legend attributes it. The legend itself is as old as the time of King Alfred, to whom a similar incident is ascribed.

Seacome records that Sir John de Stanley, second son of Sir William de Stanley, of Timperley, was born in the 27th or 28th year of King Edward III. (1354), and that he distinguished himself at the battle of Poictiers, under the Black Prince, in A.D. 1357. This was very remarkable, as, according to the chronology, he was then three years old!

He further relates that on Sir John's return from France he visited most of the Courts of Europe, where his superior skill in arms was generally applauded; that on his arrival in England he conquered a haughty French champion in the jousts at Winchester, under the eyes of the Court, among whom was the heiress of Lathom, young, beautiful, and rich, by which feat he won the fair lady and gained her inheritance.

As Lady de Stanley's eldest child was not born until thirty years after this event, the strong probability is that she was not then in existence; and the doughty victor himself could not have been more than six years old!

Now let us see what light is thrown on the subject by the documents to which I have called attention. They prove demonstratively that the story, in whichever form it is presented, is a fiction from beginning to end. The true narrative is as follows:—

Sir Thomas de Lathom, the father of Lady de Stanley, so far from being childless, or having only a daughter, had five children, two sons and three daughters, all of whom attained maturity. His second son, Edward, died before his father, leaving a widow. Sir Thomas died in March, 1382.

His elder son, Thomas, succeeded, and inherited the estates, which he only enjoyed a year and a half, dying Nov. 3, 1383, leaving a posthumous daughter, Ellena, born three months after her father's decease. At her death, issue in the male line having failed, Isabella, the eldest daughter, who had married Sir John de Stanley, succeeded, in ordinary course, to the property, which has descended to the Stanleys, Earls of Derby, to the present day.

Lady de Stanley survived her husband a few months, dying on Oct. 26, 1414. On March 12 previously, she had settled the estates on Henry de Halsale, Archdeacon of Chester, and Richard de Stanley, Parson of Walton Church, in trust for her son, the second John de Stanley, then aged twenty-eight years. The specific manner in which the Inquisitions deal with the property of Sir Thomas de Lathom precludes the idea of any supposed Oskatell inheriting or even existing.

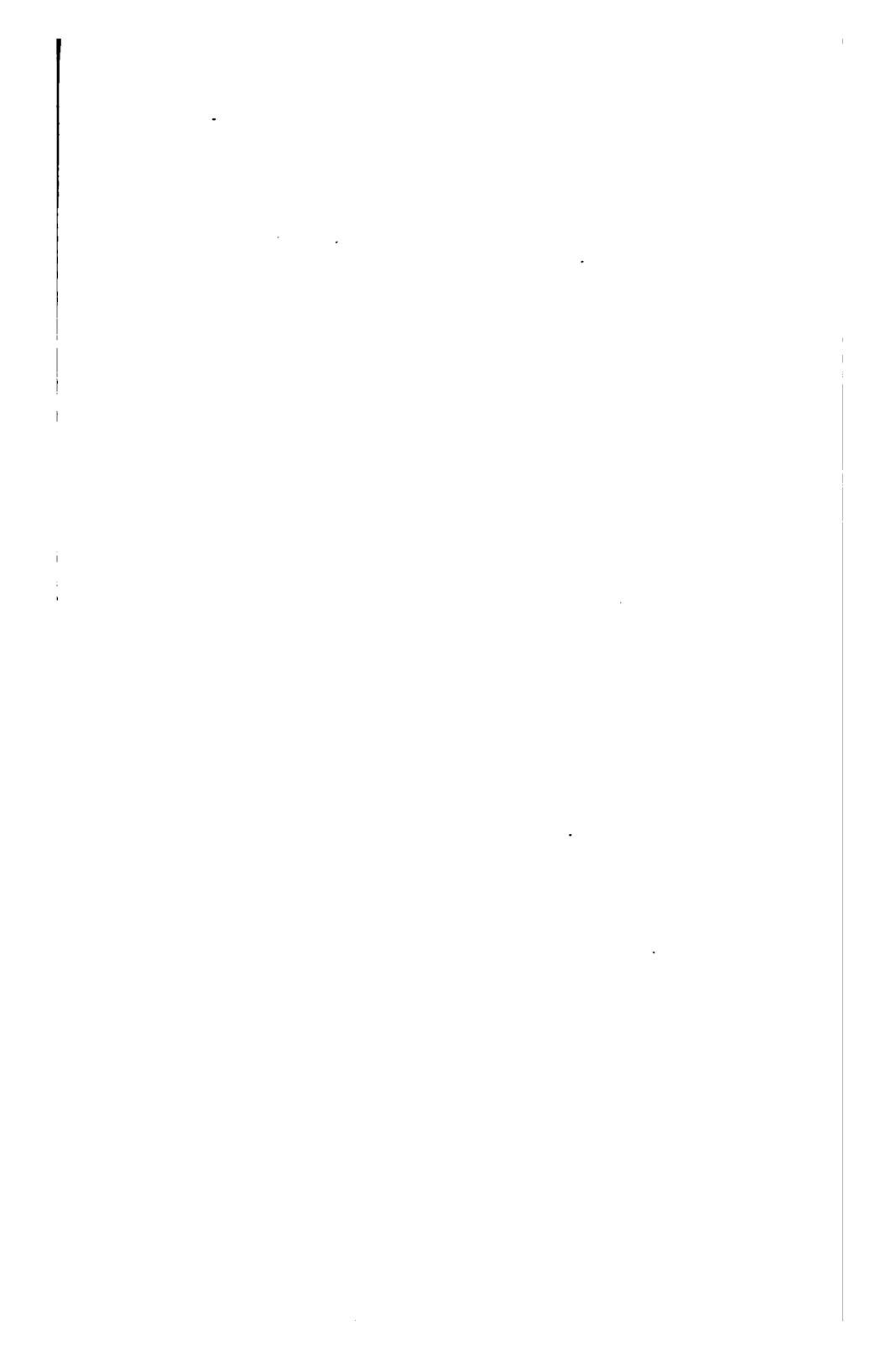
An Inquisition, 8 Richard II. (March 6, 1385), draws a lamentable picture of domestic life. Poor Sir Thomas, so far from being the "galantuomo" the legend represents, was himself the victim of his second wife's frailties. The document states that Johanna, the lady in question, had formed an adulterous connexion with Roger de Fazakerlegh, and, her husband being in a feeble state of health, she had introduced the said Roger into the hall at Knowsley, "in magnum dispectum dicti Thome mariti sui," "et jacuit cum Rogero de Fazakerlegh adultero suo apud Knowesleigh in alta camera in lecto predicti Thome mariti sui et in aliis locis secrete et aperte ad voluntatem ipsius Johanne," &c. It is further related that at her husband's decease she had carried his corpse to the Priory of Burscough, and there interred it without priest or religious rites, and immediately thereafter, being then pregnant, she had intermarried with the said Roger, her paramour. It does not appear that Lady de

Stanley and her husband at all interfered on poor Sir Thomas's behalf. It is more than probable that they were not married until after his decease.

It appears to me that the circumstances here related indicate pretty clearly the origin of the crest of the eagle and child. The eagle already existed as the cognizance of the Lathom family, and passed with the estates to the Stanleys. The illegitimate offspring of Johanna, above alluded to, if a son, would *prima facie* have a claim to the inheritance, which the report in the Inquisition would set aside. What, therefore, more natural than the adoption of the device of the eagle of the Stanleys triumphing, or, metaphorically, picking out the eyes of the babe in the cradle?

The traditionary account of these circumstances, garbled and modified as such stories usually are, crystallised into the myth of the illegitimate babe Oskatell. This is strongly confirmed by the language of the legend itself, which goes on to say that "Sir Oskatell, being degraded and supplanted in the hopes and prospect of an immense fortune, was slighted and despised by his unthought-of rivals, who, either to distinguish or aggrandise themselves, or in contempt and derision of their spurious brother, took upon them the eagle and child for their crest, in token of their conquest over him."

It is to be feared that many a pretty legend, when tested by the dry light of documentary evidence, will, in a similar manner, turn out "the baseless fabric of a vision," but "*veritatis simplex oratio est.*"



## THE JANAL 14-ACRAL 14-EDRA.

By T. P. KIRKMAN, M.A., F.R.S.

MANY years ago I was led, by my curiosity about autopolar polyedra, to construct to a certain extent the tables of the 14-acral 14-edra. As the janal tables are complete, it may be worth while to preserve a summary of them. They give an idea of the rate at which the janal-anaxine solids increase. Of these there are (Vol. xxix., 1874-5, p. 268,) sixty-four among the 14-acral 12-edra, and three hundred and fifty-two among the 14-acral 14-edra.

TABLE A.—JANAL SOLIDS OF THE 14-ACRAL 14-EDRA.

1. Six zoned triaxines.
2. Fifty-nine 2-ply monaxine monozones.
3. Three hundred and fifty-two janal anaxines.
4. Thirteen zoneless triaxines.

TABLE B.—JANAL POLES ON THE 14-ACRAL 14-EDRA.

Two-zoned polar faces.—(4) = 5; (6) = 1.

Two-zoned polar summits.—(4) = 5; (6) = 1.

Zoned polar edges.—(55) = 1; (44) = 2; (33) = 3.

Zoneless polar faces.—(4) = 20; (6) = 4.

Zoneless polar summits.—(4) = 20; (6) = (4).

Zoneless polar edges.—(55) = 13; (44) = 27; (33) = 10.

TABLE C.—JANAL MONOZONE FEATURES OF THE 14-ACRAL 14-EDRA.

Janal monozone faces.—(7) = 3; (6) = 18; (5) = 18;  
(4) = 40; (3) = 58.

Janal monozone summits.—(7) = 3; (6) = 18; (5) = 18;  
 (4) = 40; (3) = 58.

Janal zonal edges.—(55) = 11; (44) = 28; (33) = 28.

Janal epizonal edges.—(37) = 8; (36) = 9; (34) = 29;  
 (35) = 10; (44) = 1; (45) = 9; (55) = 1.

TABLE D.—JANAL ANAXINE FEATURES OF THE 14-ACRAL  
 14-EDRA.

Janal anaxine faces.—(7) = 6; (6) = 79; (5) = 368;  
 (4) = 846; (3) = 1309.

Janal anaxine summits.—(7) = 6; (6) = 79; (5) = 368;  
 (4) = 846; (3) = 1309.

Janal anaxine edges.—(37) = 86; (47) = 15; (56) = 33;  
 (55) = 125; (46) = 181;  
 (45) = 639; (36) = 299;  
 (35) = 994; (44) = 578;  
 (34) = 1427; (33) = 629.

TABLE E.—THE JANAL SOLIDS, GROUPED BY THEIR FACES  
 AND SUMMITS.

1. *Zoned Triaxines.*

- 1 of  $6^3 4^4 3^4 3^4 = 4^3 8^4 4^8$ .
- 1 of  $4^3 3^4 4^8 = 6^3 4^4 3^4 3^4$ .
- 1 of  $4^3 5^4 3^4 3^4 = 4^3 8^4 4^8$ .
- 1 of  $4^3 3^4 4^8 = 4^4 5^4 3^4 3^4$ .
- 1 of  $4^3 4^4 4^4 3^4 = 4^3 8^4 4^8$ .
- 1 of  $4^3 3^4 4^8 = 4^3 4^4 4^4 3^4$ .

2. *2-ply Monozone Monaxines.*

- 2 of  $4^3 3^3 3^3 5^4 3^4 = 4^3 8^3 8^3 5^4 3^4$ , both autopolars.
- 2 of  $4^3 3^3 3^3 5^4 3^4 = 4^3 8^3 8^3 4^4 4^4$ .
- 2 of  $4^3 3^3 3^3 4^4 4^4 = 4^3 8^3 8^3 8^4 5^4$ .
- 1 of  $4^3 3^3 3^3 4^4 4^4 = 4^3 8^3 8^3 4^4 4^4$ , autopolar.

2 of  $6^2 4^4 3^4 3^4 = 6^2 8^2 8^2 4^4 8^4$ .  
 3 of  $6^2 4^4 3^4 3^4 = 5^2 8^2 4^2 3^4 4^4$ .  
 1 of  $6^2 4^4 3^4 3^4 = 4^2 8^2 8^2 5^4 8^4$ .  
 1 of  $6^2 4^4 3^4 3^4 = 4^2 8^2 8^2 4^4 4^4$ .  
 1 of  $4^2 5^4 3^4 3^4 = 6^2 8^2 8^2 4^4 8^4$ .  
 4 of  $4^2 5^4 3^4 3^4 = 5^2 4^2 8^2 4^4 8^4$ .  
 1 of  $4^2 4^4 4^4 3^4 = 6^2 8^2 8^2 4^4 8^4$ .  
 5 of  $4^2 4^4 4^4 3^4 = 5^2 4^2 8^2 4^4 8^4$ .  
 2 of  $6^2 3^2 3^2 4^4 3^4 = 6^2 4^4 8^4 8^4$ .  
 3 of  $5^2 3^2 4^4 4^4 3^4 = 6^2 4^4 8^4 8^4$ .  
 1 of  $4^2 3^2 3^2 5^4 3^4 = 6^2 4^4 8^4 4^4$ .  
 1 of  $4^2 3^2 3^2 4^4 4^4 = 6^2 4^4 8^4 4^4$ .  
 1 of  $6^2 3^2 3^2 4^4 3^4 = 4^2 5^4 8^4 8^4$ .  
 4 of  $5^2 4^2 3^2 4^4 3^4 = 4^2 5^4 8^4 8^4$ .  
 1 of  $6^2 3^2 3^2 4^4 3^4 = 4^2 4^4 4^4 8^4$ .  
 5 of  $5^2 4^2 3^2 4^4 3^4 = 4^2 4^4 4^4 8^4$ .  
 1 of  $7^2 4^2 3^2 3^4 3^4 = 4^2 4^4 4^4 8^4$ .  
 1 of  $7^2 4^2 3^2 3^4 3^4 = 4^2 5^4 8^4 8^4$ .  
 1 of  $7^2 4^2 3^2 3^4 3^4 = 6^2 4^4 8^4 8^4$ .  
 1 of  $6^2 5^2 3^2 3^4 3^4 = 6^2 4^4 8^4 8^4$ .  
 1 of  $5^2 5^2 4^2 3^4 3^4 = 4^2 4^4 4^4 8^4$ .  
 1 of  $4^2 4^4 4^4 3^4 = 7^2 4^2 3^2 8^4 8^4$ .  
 1 of  $4^2 5^4 3^4 3^4 = 7^2 4^2 8^2 8^4 8^4$ .  
 1 of  $6^2 4^4 3^4 3^4 = 6^2 5^2 8^2 8^4 8^4$ .  
 1 of  $4^2 4^4 4^4 3^4 = 5^2 5^2 4^2 8^4 8^4$ .  
 1 of  $4^2 3^2 3^2 4^4 4^4 = 5^2 8^2 4^2 4^4 8^4$ .  
 1 of  $4^2 3^2 3^2 5^4 4^4 = 5^2 8^2 4^2 4^4 8^4$ .  
 1 of  $4^2 4^2 4^2 3^2 3^4 4^4 = 4^2 4^4 4^4 8^4$ .  
 1 of  $5^2 3^2 4^2 4^4 3^4 = 4^2 8^2 8^2 4^4 4^4$ .  
 1 of  $5^2 3^2 4^2 4^4 3^4 = 4^2 8^2 8^2 5^4 4^4$ .  
 1 of  $4^2 4^4 4^4 3^4 = 4^2 4^2 4^2 8^2 8^2 4^4$ .

**3. Janal Anaxine Solids.**

1 of  $7^3 4^2 3^2 3^2 3^2 3^2 = 7^3 4^2 3^2 3^2 3^2 3^2$ , autopolar.

1 of do. =  $6^2 5^2 3^2 3^2 3^2 3^2$ .

1 of do. =  $6^2 4^2 4^2 3^2 3^2 3^2$ .

1 of do. =  $5^2 5^2 4^2 3^2 3^2 3^2$ .

2 of do. =  $5^2 4^2 4^2 4^2 3^2 3^2$ .

5 of  $6^2 5^2 3^2 3^2 3^2 3^2 = 6^2 4^2 4^2 3^2 3^2 3^2$ .

5 of do. =  $5^2 4^2 4^2 4^2 3^2 3^2$ .

5 of do. =  $5^2 5^2 4^2 3^2 3^2 3^2$ .

14 of  $6^2 4^2 4^2 3^2 3^2 3^2 = 5^2 5^2 4^2 3^2 3^2 3^2$ .

26 of do. =  $5^2 4^2 4^2 4^2 3^2 3^2$ .

4 of do. =  $4^2 4^2 4^2 4^2 3^2 3^2$ .

13 of do. =  $6^2 4^2 4^2 3^2 3^2 3^2$ , of which one is autopolar.

24 of  $5^2 5^2 4^2 3^2 3^2 3^2 = 5^2 5^2 4^2 3^2 3^2 3^2$ , of which two are autopolars.

43 of  $5^2 5^2 4^2 3^2 3^2 3^2 = 5^2 4^2 4^2 4^2 3^2 3^2$ .

7 of do. =  $4^2 4^2 4^2 4^2 3^2 3^2$ .

10 of  $5^2 4^2 4^2 4^2 3^2 3^2 = 4^2 4^2 4^2 4^2 3^2 3^2$ .

66 of do. =  $5^2 4^2 4^2 4^2 3^2 3^2$ , of which two are autopolars.

If to the above 229 we add the 123 reciprocals of those among them whose list of faces is not that of their summits, i.e., if we exchange faces and summits of the 123, we have the 352 janal anaxines.

**4. Zoneless Triaxines.**

1 of  $6^2 4^4 3^4 3^4 = 4^2 4^4 4^4 3^4$ .

1 of  $6^2 4^4 3^4 3^4 = 4^2 5^4 3^4 3^4$ .

1 of  $6^2 4^4 3^4 3^4 = 6^2 4^4 3^4 3^4$ , autopolar.

1 of  $4^2 5^4 3^4 3^4 = 6^2 4^4 3^4 3^4$ .

1 of  $4^2 4^4 4^4 3^4 = 6^2 4^4 3^4 3^4$ .

1 of  $4^2 5^4 3^4 3^4 = 4^2 5^4 3^4 3^4$ , autopolar.

$$2 \text{ of } 4^2 5^4 3^4 3^4 = 4^2 4^4 4^4 8^4.$$

$$2 \text{ of } 4^2 4^4 4^4 3^4 = 4^2 5^4 3^4 8^4.$$

$$3 \text{ of } 4^2 4^4 4^4 3^4 = 4^2 4^4 4^4 8^4, \text{ of which one is autopolar.}$$

The exponents are all multipliers, and give the number of faces or summits which have the same configuration. Thus, the first in Table E is a solid of four different faces, a hexagon, a tetragon, and two triangles, all occurring four times, except the hexagon. It has three summits, a triace, and two tessaraces.

A similar Table E ought to have been added for all the janal 12-edra enumerated in my previous paper above referred to. It may, one day, be an interesting ambition for some student to form, without tentative process, these additional tables. If it should turn out that the primary molecular arrangements of what they call atoms are polyacrons, the study of the symmetry and enumeration of these bodies may come to have some value. Its main charm at present resides in its incredible difficulty.

I shall content myself with constructing the twelve autopolar janal 14-acral 14-edra, of which three are 2-ple monozone monaxines, six are janal anaxines, and three are zoneless triaxines. The three monozone monaxines are:—

ABCE<sub>1</sub>, A<sub>1</sub>BCE<sub>1</sub>, AA<sub>1</sub>ee<sub>1</sub>, CDE, CDE<sub>1</sub>, ABA<sub>1</sub>, EDE<sub>1</sub>,  
abceE<sub>1</sub>, a<sub>1</sub>bce<sub>1</sub>E, aa<sub>1</sub>EE<sub>1</sub>, cde, cde<sub>1</sub>, aba<sub>1</sub>, ede<sub>1</sub>.

ABdEE, ABd<sub>1</sub>e<sub>1</sub>e, BdCd<sub>1</sub>, AE<sub>1</sub>e, cE<sub>1</sub>e, dCE, d<sub>1</sub>Ce<sub>1</sub>,  
abDee, abD<sub>1</sub>E<sub>1</sub>E, bDcD<sub>1</sub>, ae<sub>1</sub>E, CeE<sub>1</sub>, Dce, D<sub>1</sub>cE<sub>1</sub>,

BD<sub>1</sub>CD, BAeD, BAe<sub>1</sub>D<sub>1</sub>, Deed<sub>1</sub>, Dd<sub>1</sub>E<sub>1</sub>C, Aee<sub>1</sub>, eee<sub>1</sub>,  
bdcd<sub>1</sub>, baEd, baE<sub>1</sub>d, D<sub>1</sub>e<sub>1</sub>cd, D<sub>1</sub>dEC, aEE<sub>1</sub>, CEE<sub>1</sub>.

E<sub>1</sub>e in the first, e<sub>1</sub>e in the second, and Dd<sub>1</sub> in the third, are the zoneless polar edges. Each has a zoned 4-gon, and two zoned triangles. The 4-gon AA<sub>1</sub>ee<sub>1</sub> has two epizonal edges; BdCd<sub>1</sub> and BD<sub>1</sub>CD have none, but have each two zoned summits, the triace B and the 4-ace C.

The six autopolar janal anaxines follow :—

**ABCDEF**, **EDfg**, **Eba**, **Eag**, **Ebc**, **Fde**, **CBe**,  
**abcdefg**, **edFG**, **eBA**, **eAG**, **eBC**, **fDE**, **cbE**.

**ABCDEF**, **CDG<sub>a</sub>**, **ABf**, **AFbc**, **GDE**, **Aef**, **GEa**,  
**abcdef**, **c<sub>d</sub>gA**, **abF**, **afBC**, **gde**, **aEF**, **geA**.

**ABCDE**, **BCFG<sub>a</sub>**, **FDC**, **FDE**, **AFE**, **AFGb**, **ABg**,  
**abcde**, **befgA**, **fdc**, **fde**, **afe**, **afgB**, **abG**.

**ABCDE**, **EDgbc**, **dGAF**, **AEF**, **dEF**, **ABG**, **Ecd**,  
**abcde**, **edGBC**, **Dgaf**, **aef**, **Def**, **abg**, **eCD**.

**DEFcb**, **ABCD**, **BGFd**, **AGFE**, **AGB**, **CDf**, **DEA**,  
**defCB**, **abcd**, **bgfD**, **agfe**, **agb**, **cdF**, **dea**.

**ABCDE**, **ABed**, **Agcb**, **Adfg**, **CDF**, **AEb**, **GFC**,  
**abcde**, **abED**, **aGCB**, **aDFG**, **cdf**, **aeB**, **gfc**.

The three autopolar zoneless triaxines are the following:—

**ABC<sub>a</sub>**, **Acba**, **ABD**, **A<sub>1</sub>B<sub>1</sub>D**, **A<sub>1</sub>DBc<sub>1</sub>**, **ADB<sub>1</sub>c**, **BCb<sub>1</sub>c**,  
**A<sub>1</sub>B<sub>1</sub>C<sub>1</sub>a**, **A<sub>1</sub>c<sub>1</sub>b<sub>1</sub>a**, **abd**, **a<sub>1</sub>b<sub>1</sub>d**, **a<sub>1</sub>dbC<sub>1</sub>**, **adb<sub>1</sub>C**, **bcB<sub>1</sub>C<sub>1</sub>**.

The three zoneless poles are the 4-ace **D**, the 4-gon  
**BCb<sub>1</sub>c<sub>1</sub>**, and the edge **Aa**.

**ABCD<sub>1</sub>**, **A<sub>1</sub>B<sub>1</sub>C<sub>1</sub>D<sub>1</sub>A**, **Ab<sub>1</sub>s<sub>1</sub>B**, **A<sub>1</sub>Dc**, **a<sub>1</sub>DC**, **A<sub>1</sub>cb**, **aC<sub>1</sub>B<sub>1</sub>**,  
**abcDa<sub>1</sub>**, **a<sub>1</sub>b<sub>1</sub>c<sub>1</sub>D<sub>1</sub>a**, **aB<sub>1</sub>A<sub>1</sub>b**, **AD<sub>1</sub>c<sub>1</sub>**, **aD<sub>1</sub>C<sub>1</sub>**, **Ac<sub>1</sub>b<sub>1</sub>**, **a<sub>1</sub>CB<sub>1</sub>**.

The zoneless poles are the 4-ace **D**, the 4-gon **Ab<sub>1</sub>aB<sub>1</sub>**,  
and the edge **AA<sub>1</sub>**.

**Adcad<sub>1</sub>C<sub>1</sub>**, **ABC<sub>A</sub>**, **A<sub>1</sub>B<sub>1</sub>C<sub>1</sub>A**, **ABd**, **A<sub>1</sub>B<sub>1</sub>D**, **Bdc**, **B<sub>1</sub>d<sub>1</sub>C<sub>1</sub>**,  
**A<sub>1</sub>Dc<sub>1</sub>a<sub>1</sub>D<sub>1</sub>C**, **aB<sub>1</sub>c<sub>1</sub>a**, **a<sub>1</sub>Bca**, **aB<sub>1</sub>d<sub>1</sub>**, **a<sub>1</sub>BD**, **B<sub>1</sub>Dc<sub>1</sub>**, **BD<sub>1</sub>C**.

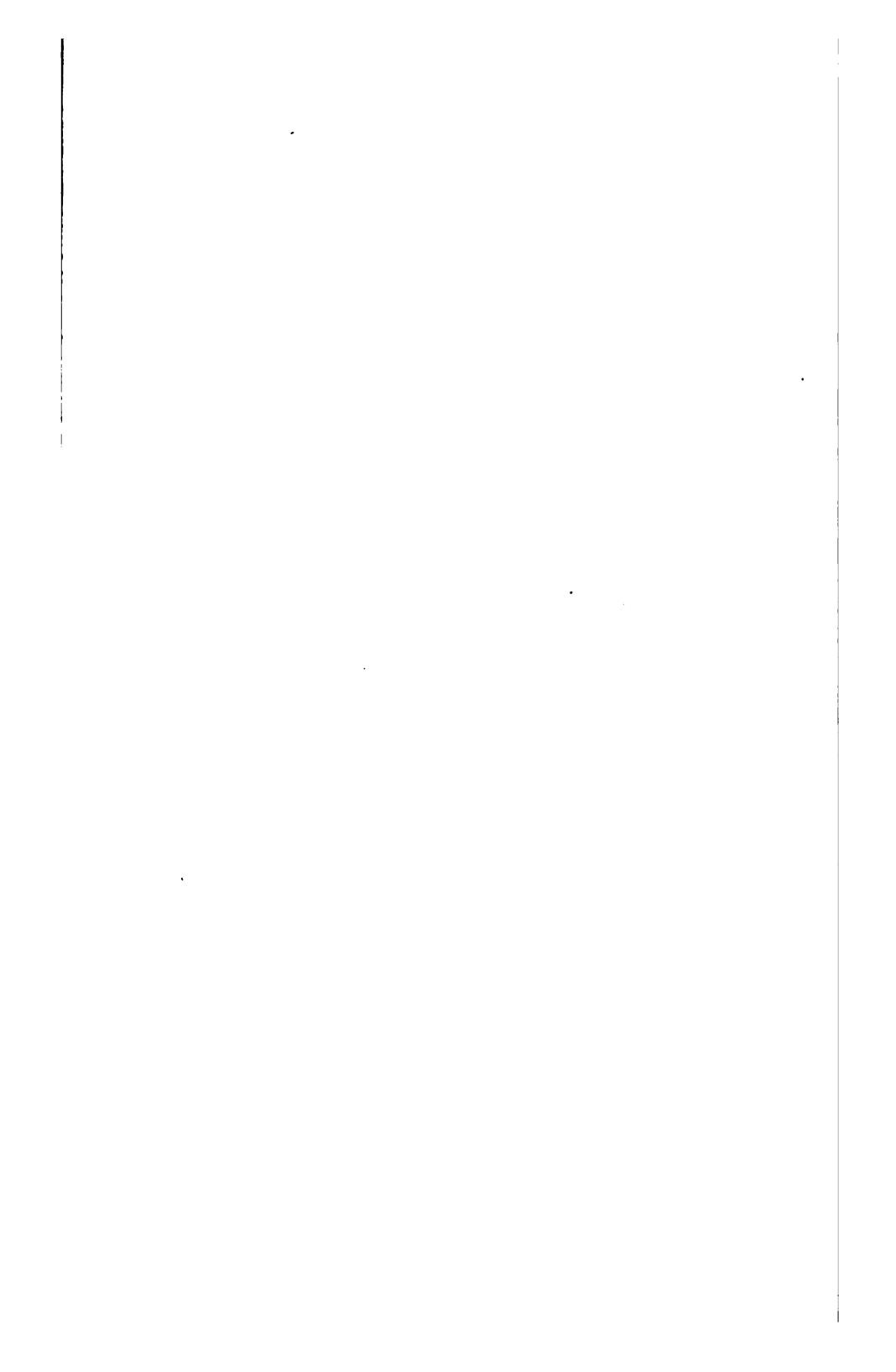
The zoneless poles are the hexace **B**, the hexagon  
**Adcad<sub>1</sub>C<sub>1</sub>**, and the edge **AA<sub>1</sub>**.

As the zoneless triaxines have no janal features besides their three poles, they do not read so symmetrically as the preceding figures. All these constructions would be, perhaps, more intelligible if to every summit were appended a sinister suffix denoting its rank, as 6 to the hexace B, 4 to the 4-ace A, &c. Any student who may take a fancy to the subject can do that for himself.

How many autopolars there are among the scores of thousands of non-janal 14-acral 14-edra, I have not examined. This may be one of the amusements of my old age.

---

Let me correct two oversights in my Paper in the preceding volume. At page 257, line 18, for *monozone* read *homozone*, as it rightly stands on page 260. In line 14, for *one* read *three*; for the following Table B contains 18 janal 2-ple zoneless poles, of which six are in the six 2-ple monaxine monozones, two in the homozones (1 and 5), and one in the 2-ple janal monaxine (7). The remaining nine must be found in three zoneless triaxines: and by this rule these solids are always enumerated.



## VEGETATION AND CLIMATE.

By RICHMOND LEIGH, M.R.C.S.E.

GEOGRAPHICAL Botany was raised to the position of a special and important science by Humboldt. He laid the foundation upon which De Candolle, Schouw, Meyen, and others have built up the noble but unfinished structure of the present time. Meyen, more particularly, shewed that, as certain regions contained certain plants, these plants indicated the region in which they were found as regards its climate. This character of the vegetation of any climate is in all cases sufficiently well marked to shew plainly the climate of that region, and is a more certain guide than any other save that of registered facts, which it nearly equals. From our want of knowledge of the range of many plants, our deductions are necessarily very imperfect, but still most valuable. As our botanical knowledge increases, our climatological information will also grow, until, sooner or later, we shall be able to indicate the climate of any region from the examination of its flora, almost perfectly.

In most countries vegetation is met with under two conditions, natural, or in a state of nature, and cultivated. The former, being exposed to all natural influences, is the most valuable guide to the character of any regional climate, and should be chiefly relied upon in any such research. Cultivated vegetation is also of great value for this purpose, but this value varies according to the more or less artificial conditions of culture. A plant grown from seed sown by man, and otherwise unintended, is equivalent, for climatic purposes, to one produced in a state of nature; but if the

plant be protected from cold, and watered in dry weather, it will give little indication of the climate of its habitat. The deserts of tropical and sub-tropical regions would be covered with luxuriant vegetation, were they supplied with abundant moisture, as seen in Egypt, where the overflow of the Nile is the determinant of the harvest. Therefore, in estimating the value of plants under cultivation, it is necessary to know the conditions of cultivation, so that, these being known, we may then be able to use the plants as climate indicators. It has been considered by some that plants under care and cultivation may be altered in habit, and made able to bear greater extremes of temperature and moisture than in a state of nature. This is true in but a limited degree, and it may be considered as an axiom, that plants are not capable of true acclimatisation. Our fruit trees, and other plants too numerous to mention, are as sensitive to frost now as they were in all probability a thousand years ago; and the instances in which imported plants are said to have been hardened and acclimatised will, on close examination, generally be found incorrect. Our worthy President has given us his experience in growing the Eucalyptus, which every care fails to make endure our climate. Taking into consideration, then, the conditions under which cultivated plants are grown, the knowledge obtained may be utilised in estimating any given climate.

There is of necessity, even with every favouring circumstance, always a limit (at least towards the poles) to the flourishing growth of plants, though their natural area may be greatly extended by cultivation.

*Temperature*—of the factors which go to form “climate,” is by far the most important, and has much more influence on vegetation than any other. A constant, though irregular, development in plant growth is found as we proceed from the

poles to the equator. The effect of heat is so notable, that Dr. Carpenter considers it to be *the* vital force, and though this may be considered doubtful or improbable, it is none the less certain that heat is an essential condition of the working of that mysterious agency—life.

The development of plants with increasing temperature is shewn by their greater size, both as a whole and in their individual parts, by their greater numerical ratio, both as regards species and individuals, and by their increased beauty or strangeness of form and colour, as well as by their more vigorous growth. This development is especially shown in the *Endogenous* division of plants, none of which assume the arborescent form till we come to the warmer temperate zone, where a small palm, the *Chamærops humilis*, is met with. Endogenous trees or shrubs are not met with in numbers till we reach the tropics, where palms, screw pines, bananas, bamboos, and other members of this plant section form an important feature in the physiognomy of the vegetation. The development in size produced by increased temperature is well shown in the order *Gramineæ*, the representatives of our humble grasses, rising in the tropics to the height of fifty, sixty, and even one hundred feet (Gardner), thus surpassing our forest trees in height. The lilies of our climate are represented by the aloes and dragon trees of hot regions, and numberless similar examples may be cited.

*Acrogens* are also only found arborescent in warm climates, where the graceful tree ferns attain to fifty or sixty feet in height.

*Exogens*, though not exhibiting so marked an increase in size with increased temperature as a whole, still present in many individual instances very great advancement in this respect, as in the mallows and their allies, which may be considered to be represented by the enormous Baobab trees of Africa.

The *individual parts* of plants also show this *increased* development. The largest leaf expansion, as seen in the banana, is only found in the moist torrid zone. The *Rafflesia* of Java bears flowers often eight or nine feet in circumference, and fourteen pounds in weight, and an *Aristolochia*, on the river Magdalena of South America, has flowers four feet in circumference, which are used occasionally by the natives as hats.

Nearly all orders of plants *increase in numerical ratio* towards the equator, there being but few exceptions, and these generally lowly in form, as the *Juncaceæ*, or rush tribe. Meyen remarks, that "the lower the plant form, the wider the range"—a correct general axiom. The reverse may be stated, that "the higher and more developed the plant, the more limited its range." Many orders are limited to the torrid zone, and a considerable number are bounded by the tropics. The number of plants increasing individually as well as collectively, there is necessarily more variety towards the equator; a fact prominently shewn in the forests, which are much more diversified in character, and have not the social aspect of those of colder regions.

The *coloration* of plants depending on the light of the sun, it were to be expected that we should find the most vivid hues beneath a tropic sky, this vividness of coloration extending to the green parts of plants, which are of a much brighter and fresher hue. The various parts of plants also present more strangeness of form towards the equator, as when the Orchids mimic the forms of insect life so exactly as often to deceive the human eye.

Increase of temperature also shews remarkable results—the *increased vigour* of plants, which, in the torrid zone, grow with a rapidity unknown in colder regions. This may be considered to account in great measure for the

productions of the tropics; for, given the special impetus to one portion of a plant or flower, the rapidity of growth of that part produces the strange and unsymmetrical appearance of the flower or plant in question.

While the mean temperature constantly rises proceeding from the poles to the equator, its *range* diminishes till it reaches its minimum at the equator, where the seasons of the year are little marked, at least as regards the temperature. In this latter region the seasons are chiefly known according to the rainfall, as the "dry" or "wet" season, and not, as with us, by spring, summer, &c.

This range of temperature has a most important influence on vegetation; which latter, carefully studied, gives us the extent of the former very precisely, more particularly with regard to its lowness. Naples and New York are nearly in the same latitude; but while in the former orange trees flourish in the open air, in the latter they cannot even exist, and do not grow for some distance further south. Yet the summer of New York is as hot as that of Naples. Hence the conclusion comes naturally, that it must be owing to the severe winter. Other circumstances may combine to produce this effect, but this is certainly the chief.

But while the lower limit of temperature has a most marked influence on vegetation, the higher one has but little comparatively, few plants being limited towards the equator. Most plants have a tolerably well-defined limit towards the poles, but appear able to endure almost any amount of heat. Corn is cultivated from  $70^{\circ}$  north latitude to the equator. But, though the limit is ill-defined simply with regard to height of temperature, it is generally sufficiently marked, owing to the more luxuriant growth of other vegetation. The cold limit of plants is practically sufficient to indicate the regional climate, as there are plants limited to the

hottest—to even a few degrees each side of the equator—and every succeeding zone of the earth; so that each region is indicated by either positive or negative evidence—by the presence or absence of plants.

It is by the combination of this positive and negative evidence that we can best estimate the regional climate; and not by the positive alone, which method has hitherto, as far as I know, only been pursued.

The third climate factor, the second in importance, is *moisture*. An abundant supply of water is especially necessary to vegetation in climates of high temperature, where the great evaporation needs a proportionate supply.

A high temperature and a deficient supply of moisture is sure to be associated with sterility. And, as with temperature, so with regard to moisture, the range is of great importance, and those climates which have an abundant and equable distribution of water, in whatever way, are characterised by the most luxuriant vegetation; while those that suffer from prolonged droughts have their flora proportionately affected. The latter condition produces a perfectly characteristic vegetation, shown notably in the *Cactaceæ*, *Aloes*, &c., and, to a less degree, in the heaths and rigid-leaved trees of Australia.

Luxuriant mixed forests always indicate an abundant supply of water. Darwin says, "In South America the limit of the forest land follows in a remarkable manner that of the damp winds. On the west, where the gales charged with moisture from the Pacific prevail, every island on the broken coast, from lat. 38° S. to the extreme of Terra del Fuego, is densely covered by impenetrable forests, &c." And this is still more marked as we approach the equator. There are open forests in dry regions, as in Australia, but these do not present the luxuriant and mixed character of the true forests, and are composed chiefly of rigid-leaved *Proteaceæ*, *Acacia*, *Eucalypti*, and other plants, the whole having a dull appear-

ance, and lacking the freshness and variety of the true typical forest. The Caatinga of Brazil presents a similar example of open forest, the result of a limited supply of moisture, and exhibits, as an effect of this, the phenomenon—singular to us—of shedding its leaves in summer, the dry season, and being verdant in winter only.

Deficient moisture produces the same retardation of growth that low temperature does, though in a less degree. Livingstone remarks, that, "in the well watered country, plants which in the dry regions of the south (with a nearly equal temperature) are mere shrubs, become great trees."

These four factors, temperature and moisture, and their respective ranges, are the chief determinants of climate with regard to vegetation. A further point of importance may be added; viz., the relation which the ranges bear to each other, as it will be of great importance whether the highest temperature and the greatest humidity occur together or at opposite seasons.

Having considered the general influence of climate, through its chief factors, on vegetation, we may now proceed further, and consider its special influence on particular regions. This influence is shown by the limitation of species, though this limitation is not necessarily climatic. Physical configuration and soil are most potent, often insurmountable, barriers to the spread of plants. The Atlantic Ocean effectually stops the spread of most plants on either shore to its opposing one; and in the few cases in which plants have floated to great distances, they must of necessity be very indestructible, and can only proceed in one direction. But leaving out these two agents, climate is the only other consideration of importance as affecting vegetation. From the physical configuration of the globe preventing the continuous spread of plants, and limiting species, often most effectually, any zone or belt of equal mean temperature may

present very different flora in different parts, when those parts are separated by natural barriers, *e. g.*, South Africa and South America. But there is, notwithstanding, a similarity or analogy, at once apparent to the eye of the naturalist, and also, in nearly all cases, corresponding plants are found in greater or less numbers.

In studying the climatic character of any flora, three methods may be pursued :—

1. The whole flora of the region may be considered and analysed ;
2. Certain combinations of orders, genera, or species of plants, "climatic plant groups," may be taken as representative of the climate ; and
3. The presence of certain typical plants may be looked for.

Of these three methods, the first is of necessity the most perfect, but at the same time the most laborious, a great portion of the labour incurred being useless, from the wide diffusion of many plants. The second approaches the first in correctness of information, and is, comparatively, of easy application. The third is the simplest and least perfect, yet gives much information with little trouble.

The second method, that of climatic "plant groups," may be assumed to be the method the most useful for all ordinary purposes, but to it may be added the third, from its simplicity, and the slight additional labour entailed. It is, of course, on the correct formation of these plant groups that the exactness of our knowledge depends. These plant groups, *in their entirety*, are to be found almost throughout their respective regions or zones ; and in most of the limited portions where they are not found as a whole, some members of the group are present. With regard to the old world, and especially its northern portion, they are all but universal ; and in the new world, and in the southern parts of the old, they

are very generally met with. There is considerable variation from the standard in South America, and still more in Australia. In cases like these, plants under cultivation, being diffused almost coextensively with the human race, are of great assistance in determining climate. Certain plants, as remarked before, may be considered typical of the region in which they occur. To be so considered, the "type plant," or *climatic phytotype*, should either be absolutely limited to the region, or especially prominent in its region, though occasionally to be found elsewhere. The more limited in extent it is, the more valuable will it be as a climate indicator, its value in this respect reaching its acmè when it is actually limited to a single region. An absolute phytotype like this is comparatively rare, save in the tropical region, where all the phytotypes given in the diagram are absolute, or solely confined to that region.

Many plants have narrower limits than even this. The *Copernicia cerifera* does not extend beyond 12° south latitude, and already, according to Liais, even there its vegetation is decidedly poorer than nearer the equator. According to the same author, the limit quoted is that of many other species. He also gives 18° south latitude as the limit of the *Mauritius* palm, and makes the more surprising statement that many species of plants are limited between 12° and 18° south latitude.

From what has been already stated as to the much clearer definition of the polar as compared with the equatorial limit of plants, it would follow that absolute phytotypes would more likely appear near the equator than elsewhere. No doubt there are phytotypes absolutely confined to other regions, but they have not attracted the attention of botanists, who are generally content with enumerating the species of plants, without entering on the more laborious task of defining their area or range.

The regional divisions of the earth's climate adopted in the present Paper are, I think, in the existing state of knowledge, the most practically useful. They possess the great defect of being artificial, instead of natural. This artificiality is not so great as, at first sight, would appear, for, although arbitrary degrees of latitude have been fixed of necessity as bounding the regions, the central, or *median flora*, is the only one taken into consideration, and is of sufficiently naturally distinctive character to mark its special region. This median or central flora, as represented by the climatic plant group, is only found in its typical perfection in the *centre* of the region it characterises. Towards either margin it gradually loses its prominent character, till it merges into that of the proximate region, and it is only by comparing floras of more or less distant regions that a distinct advance is shown. It would be more correct to call it the *flora or climatic plant group of a certain mean temperature*—that of the region it is found in—in which case, “the more perfect the group, the nearer the mean temperature of that group” might be assumed as the general law.

Following Meyen, I have adopted lines of latitude as regional divisions, on account of their greater convenience. It would appear more correct to adopt isothermal lines (or still more, isochimenal), but as the various regions have no distinct border, being shaded off gradually, no line of demarcation can be absolutely fixed. The lines of latitude include nearly the whole of the regions indicated, *i. e.*, in their typical aspect, and are used conventionally as the simplest division, and as being more generally applicable and understood. To merit separation into a primary region, the flora must be decidedly distinctive and characteristic of that region alone, whatever may be the minor distinctions of secondary and tertiary divisions.

The climate of the earth is usually divided primarily into three zones—the Torrid, Temperate, and Frigid. The



## DIA

## FRIGID.

TI

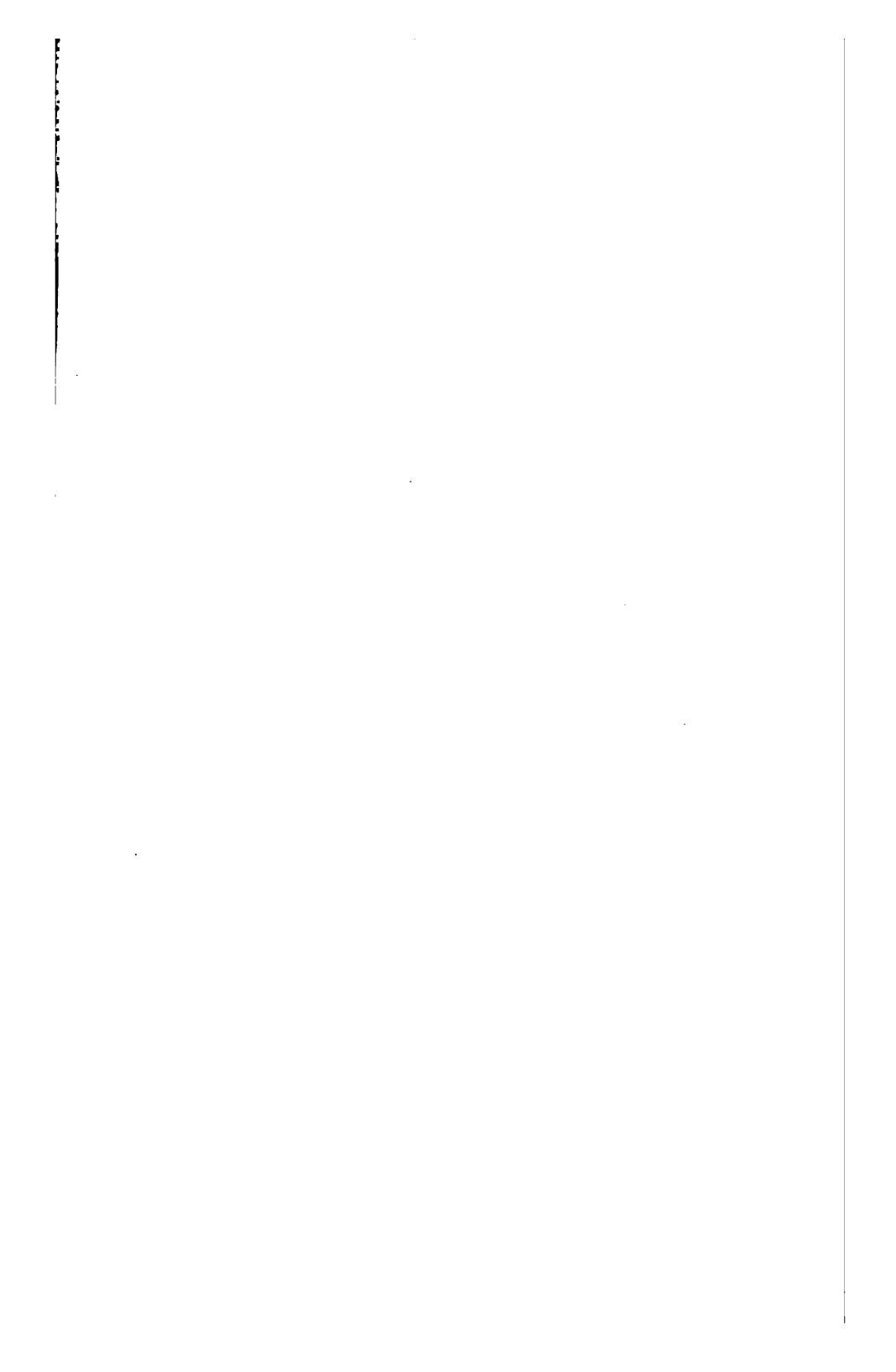
REGION .....	ARCTIC	SUB-ARCTIC.	COLD TEMPER
EXTENT FROM (LAT.) .....	Poles to 66° 32'.	66° to 58°.	58° to 45°.
MEAN TEMP. ....	15° Fahr.; -8° Cent.	41° F.; 5° C.	50° F.; 10° C.
CLIMATIC PHYTOTYPE ...	Salix Herbacea. Stunted Birch.	Birch. Pinus Sylvestris.	Beech. Oak. Apple.
CLIMATIC	Saxifragæ. Lichens. Carices. Stunted Vegetation.	Abietinæ. Willows.	Deciduous. Dicotyledon.
PLANT	POSITIVE		Abietinæ. Willows.
GROUPS	NEGATIVE	Trees.	Deciduous. Dicotyledons.
CULTIVATED	POSITIVE	Barley. Rye.	Wheat. Apple. Pear.
PLANTS	NEGATIVE	Wheat.	

MEYEN'S	ZONES.....	POLAR.	ARCTIC.	SUB-ARCTIC.	COLD TEMPE
	PLANT	Alpine Flora.	Rhododendra,	Abietinæ.	Deciduous
	GROUP.			&c.	Dicotyledon

# M A.

RATE.	TORRID.		
WARM TEMPERATE.	SUB-TROPICAL.	TROPICAL.	DRY TORRID.
45° to 34°. 59° F.; 15° C.	84° to 23°. 68° F.; 20° C.	23° to 0°. 77° F.; 25° C.	40° to 0°. 68° to 83° F.; 23° to 27° C.
Vine. Olive. Orange. <i>Hamacrops Humilis.</i>	Date Palm.	Marantaceæ. Mauritius Palm. Copernicia Cerifera.	Doom Palm. Tamarisk. Spinifex.
Evergreen Dicotyledons. Myrtles. Laurels.	Myrtles. Laurels. Bananas.	Palms. Bananas. Piperaceæ. Screw Pines. Orchids.	Cacti. Aloes. Mesembryanth. Euphorbias.
Musaceæ.	Piperaceæ.		Ferns. Epiphytes.
Pine. Maize.	Sugar Cane. Tea. Date. Coffee.	Pepper. Manioc. Bread Fruit.	Date.
Sugar Cane. Coffee. Banana.	Pepper.		

WARM TEMPERATE.	SUB-TROPICAL.	TROPICAL.	EQUATORIAL.
Evergreens. Dicotyledons.	Myrtles. Laurels.	Tree Ferns. Figs.	Palms. Bananas.



*torrid* may be considered to extend to the 34th parallel of north and south latitudes. Very many plants, and many orders of plants, are limited to this zone. It may be characterised as the zone of palms and bananas, and, in its dry regions, of cacti. The *temperate* may be bounded by the 34th and 58th parallels, and is marked by social forests of both deciduous and evergreen dicotyledons. The *frigid* zone extends from the 58th parallel to the poles, and is characterised by abietinae and stunted vegetation.

These primary zones have been variously subdivided. Meyen's division, to which I shall again refer, is the most practical and generally adopted. He divides the torrid zone into equatorial and tropical, the temperate into sub-tropical, warm and cold temperate, and the frigid into sub-arctic, arctic and polar. But the differences between certain of these are not greatly marked, and are hardly sufficient to warrant their separation as primary zones.

The equatorial and tropical zones differ, as regards climate, chiefly in the *range* of temperature, the former being the more equable, while the latter, though more distant from the equator, has the greater range both in height and lowness, but the *mean* temperature of both is nearly the same. On this account I have considered them as a single primary region. The arctic and polar regions differ only moderately with regard to their flora, and that in degree, and not so much in nature.

Considering these points, a new subdivision may be made, as follows :—

The torrid zone, into tropical and sub-tropical regions, appropriating the latter from Meyen's temperate group;

The temperate, into warm and cold; and

The frigid, into arctic and sub-arctic.

In the torrid zone a very limited amount of moisture pro-

duces such characteristic effect on the flora, that I have added a seventh region, of irregular formation—the dry torrid. In colder latitudes the effect of limited moisture produces much less special effect on the vegetation. It will be seen that, omitting the first and last regions, the mean temperature of each rises nine degrees Fahrenheit, or five degrees centigrade, proceeding from the direction of the poles to the equator.

These primary regions or zones may now be separately considered, commencing with the lowest type of vegetation, as found in the coldest zones.

The *arctic* and *antarctic* regions extend from the poles to the arctic and antarctic circles, in latitudes 66° 32', and include the polar and arctic zones of Meyen. The temperature for much the greater part of the year is below the freezing point of water. The season during which it rises above that point is very short near the poles, summer in that region lasting only for about six weeks, but during that period the sun is above the horizon uninterruptedly. Vegetation is therefore very limited. Below 70° latitude, trees are found, and occasionally as near the pole as 71° or 72°.

The first in appearance is the birch, then some firs—*Pinus Sylvestris* and *Abies excelsa*. The only other trees found in this region are the aspen and mountain ash. Hence the characteristic of this region is the undeveloped and stunted character of its flora, which is very similar to that of the "alpine" region of botanists. The positive plant group of this region includes saxifrages, lichens, rushes and carices. The undeveloped state of vegetation here is well represented by the herbaceous willow (*Salix herbacea*), which grows from six to seven inches high, and may be taken as a climatic phytotype. An entire absence of trees and of cultivated plants characterises the greatest part of this region.

---

The *sub-arctic or sub-temperate* region has the same extent as Meyen's sub-arctic zone, i. e., from about latitude 66° to 58°. There is a great increase in the mean temperature of this compared with the last region, and the summer is considerably longer; hence a corresponding improvement is seen in the vegetation. Most prominent in this region are social forests of the *Abietinae*, or fir trees, varieties of *pinus*, and *abies*. Species of poplar and birch are also numerous in this region. The birch and Scotch fir (*Pinus Sylvestris*) are typical of this region, as also some other firs, especially *Abies excelsa*, the spruce fir, &c. Willows are numerous. Negative evidence of this region is found in the general comparative absence of deciduous dicotyledonous trees, as the beech, sycamore, oak, &c., and also of cultivated wheat, and certain fruit trees, as the apple, pear, cherry, &c.

The *cold temperate* region lies between the 58th and 45th degrees of latitude, and includes our own country. Its average mean temperature is 50° Fahrenheit, or 10° centigrade. This region is characterised by the large number of deciduous dicotyledonous trees. Among these may be mentioned the oak, beech, elm, sycamore, willow, and alder. Conifers, especially species of *pinus*, are very numerous in this region, as in the last, but do not form nearly so large a proportion of the forests.

Among cultivated plants, the apple, pear, cherry, and many rosaceous plants are notable. The negative flora of this region include the orange, olive, aloe, cactus (*opuntia*), and, generally speaking, the evergreen exogens.

The *warm temperate* region extends from lat. 45° to 34°. The mean average temperature is 59° Fahrenheit. The winter season is much less marked than in the regions previously considered, frost being rare in a great part of this region.

A corresponding effect is produced on vegetation, the leaf not falling in by far the greater number of trees. Hence evergreen trees abound, and especially of the dicotyledonous section of plants which, in our climate, are notable for their deciduous nature. The evergreen oaks, the plane, chestnut, olive, and laurel abound. The orange, lemon, and vine grow luxuriantly, and the tea and cotton plants find their habitat here.

The immense *Wellingtonias* of California, the *Araucarias* of the Southern Hemisphere, the *Eucalypti*, so much overlauded as marsh driers, also mark this region. Phytotypes are the olive, orange, evergreen, and cork oak. Musaceæ—the banana family—are conspicuous by their absence. A few palms are found, especially on the equatorial border, but generally speaking they are absent.

The *sub-tropical* region extends from the 34th parallel of latitude to the tropics. Its mean temperature is 68° Fahrenheit, and frost is unknown in it. The summer temperature is as high as—often higher than—that of the tropical region, while the winter temperature is much lower. Hence plants requiring a constant high temperature fail here, while those requiring merely a hot summer flourish.

Notwithstanding this, there is a great similarity between the flora of this region and that of the tropics, and the difference lies chiefly in the comparative number of species, and not in their variation. Palms, bananas, figs, and other plants which attain their numerical maximum in the tropics, are frequently met with here, and only the comparatively small number of delicate plants are absent from this region. During the moderation of temperature in the winter season, many plants found in more temperate regions flourish, while in summer they give way to the heat or the greater luxuriance of other plants.

From what has been remarked it will be seen that the

flora of this region is more mixed and transitional than characteristic. It presents a combination of temperate plants, as myrtles, laurels, camellias, and fuchsias, with true tropical forms, as palms and bananas. Prominent among its flora are also magnolias, zamias, acacias, mimosas, and heaths.

Rice, cotton, coffee, and maize are cultivated in this region. Pepper and the nutmeg fail to succeed.

The *tropical* region proper—that lying within the tropics—shews us vegetation in its most advanced condition. In this region I have included Meyen's equatorial and tropical zones, the vegetation of which is hardly sufficiently distinct to warrant separation. The mean temperature of the region is 77° Fahr., or 25° centigrade. As Humboldt remarks, the vegetation of this district is characterised by a disposition to become arborescent; forms which in a higher latitude scarcely rise above the ground, in this region form shrubs or trees, as, *e.g.*, the grasses, ferns, and even mosses.

The flora of this region is further characterised by a great variety of forms, most notable among which are the Palms, which may be considered the noblest forms of vegetation, and which are the admiration of every traveller in this region. Their simple, yet noble and graceful form, which is only imitated in a much minor degree by the tree-fern, brings them prominently out in the tropical flora.

The *Musaceæ*—plantains and bananas, with their enormous leaves—are also a notable plant-form in this region. Other prominent types are the arborescent grasses; the Epiphytic Orchids, many of which only find sufficient moisture and heat in the damp, tropical forest; the Pandani, or screw-pines; Scitamineæ, Tree-Ferns, and the great climbers known as Llianæs. These last extend from one tree to another, often for hundreds of feet, like great ropes binding the various plants together, and forming a special feature in tropical forest vegetation. Ferns, in their various forms of

ground, tree, and climbing ferns, abound in the moist atmosphere of this district, in many parts of which it rains daily. In those places where unusually great moisture obtains, especially in some islands, as Otaheite, ferns form a fourth of the vegetation.

Many plants, and some orders—as the Marantaceæ, or arrow-root family—are only found in this region. Among species exclusively confined to this region—or absolute phytotypes—may be mentioned the Mauritius and Areca palms, and the Copernicia Cerifera.

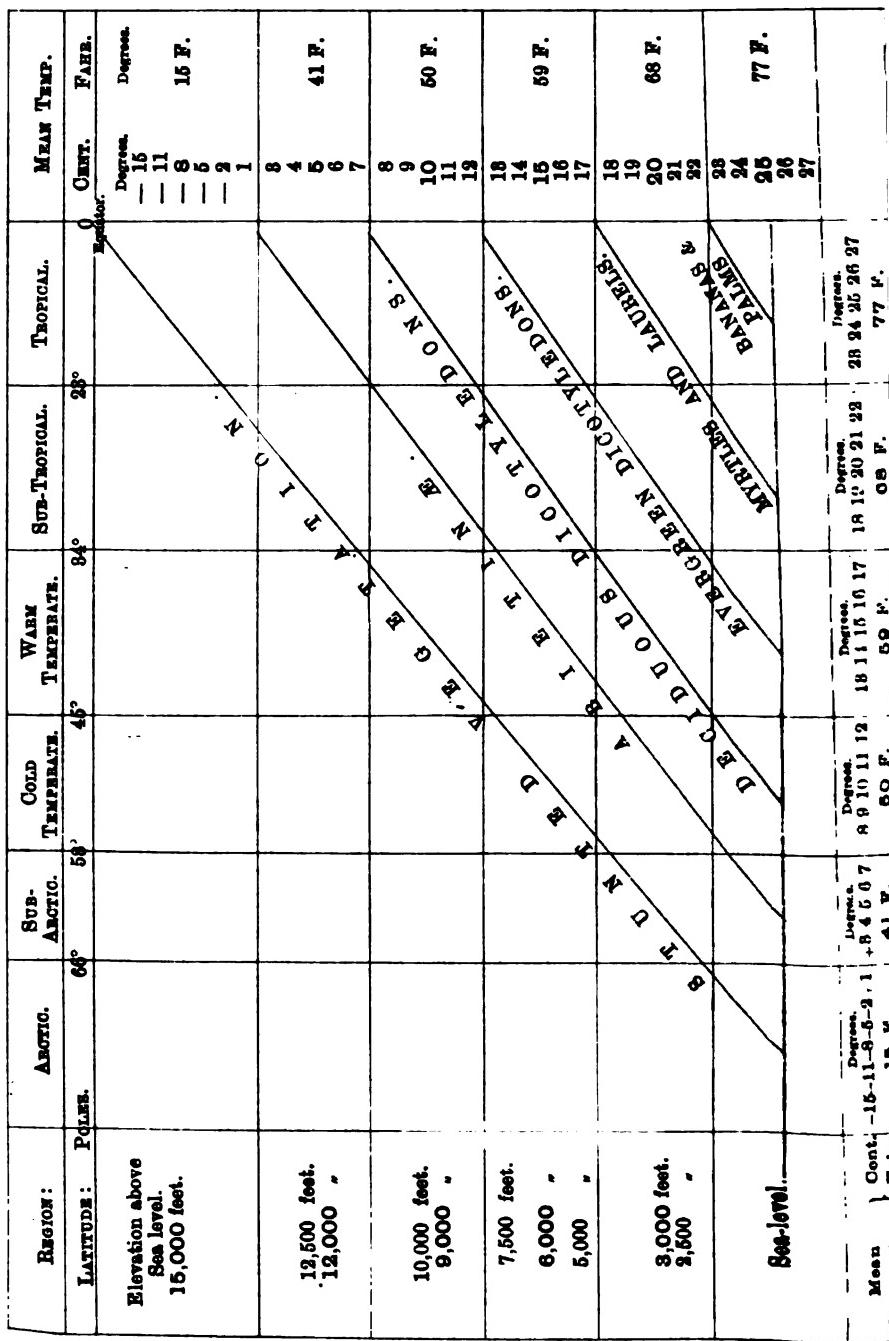
While some few orders of plants are confined entirely to this region, a very much larger number are nearly, though not quite, so restricted. The Piperaceæ, Scitamineæ, and many others are examples of this; so that this region, of necessity, possesses a much richer vegetation than any other region, as but few of the flora of other regions fail to be found here also, and nearly all orders of plants reach here their highest numerical ratio.

From the eternal summer which reigns in this region, and more particularly in the part nearer the equator, vegetation presents little change according to season, or rather time of year, and that little merely follows the distribution of moisture, so that in some parts, where the rain is deficient at one part of the year—generally the summer period—there is a slight imitation of the fall of the leaf of our climate. But this is exceptional, and, speaking generally, vegetation presents a continuous brilliant glory and grandeur, which harmonises well with the hues of the animals that inhabit these regions. Nature, here, is also most prodigal in her fertility; the banana, under tropical weather, yields somewhat like fifty times that of wheat in our climate.

But let the moisture of this region fail, and we have the *dry torrid* region, the vegetation and climate of which



DIAGRAM B.



appears so special, that I have separated it from the other regions in whose latitudes it lies. It extends to about 40° on either side of the equator. I have given it this limit, as, beyond this,—though there may be dry and more or less of barren extent of land,—the vegetation loses the distinctive character, which is due to the high temperature, combined with its dryness, and not to the infertility of the soil, as in some colder regions. The limitation of moisture—for it is never, not even in the desert of the Sahara, totally absent—produces great effects on vegetation, effects that may be separated into two divisions: in the first and more limited effect, from the greater supply of moisture, the leaf, the chief part affected, of the plant becomes hard and rigid; this characteristic is well seen in some of the plants of Australia, as the proteas, banksias, casuarinas, and leafless (?) acacias of that country. The second and true characteristic effect is the thickening of the leaf, so as to produce a fleshy organ, filled with a juicy, succulent parenchyma. This is seen typically in the cacti, aloes, &c. A more striking result is, when plants, not so naturally, become fleshy in these dry regions, e. g., stapelia and cerepegia among the *Asclepiadaceæ*, and cacalia among the *Compositæ*. Two palms, the date and the doom, are frequently found in this region. Furcress and many zygophyllaceæ, mesembryanths, euphorbias and epacridaceæ, characterise this region also.

The only plant that can be considered at all cultivated is the date palm, which, however, is almost in a state of nature. This is leaving out of the question the regions irrigated by the Nile, &c., which, though naturally in this region, by irrigation are removed from it.

A few remarks explanatory of Diagram B may be of service, especially with regard to mean temperature and the

division of regions. Taking any of the squares, say the lowest under the cold temperate heading, the "deciduous dicotyledons" line (of greatest numerical ratio) crosses the sea level at the centre of the region, the mean temperature being  $10^{\circ}$  centigrade, ascending on approaching the warmer temperate region, which it enters at about 2,500 feet elevation. The square above shows the *abietinae* line entering the cold temperate region at its boundary,  $58^{\circ}$  latitude, (mean temperature at sea level,  $7^{\circ} 5$  cent.) at an elevation of about 2,500 feet, but leaving at its equatorial boundary (mean temperature  $12^{\circ} 5$  cent.) near 5,000 feet. The two limits of the region thus present great differences, shown in the difference of mean temperature = five degrees centigrade, and of elevation of vegetation = 2,500 feet. There being this variation of mean temperature, that of the middle of the region is taken as representing a general average, it being the mean of many mean temperatures.

The difficulty of drawing a border line between the various regions is shown by the gradual ascent of any one form of vegetation through the various regions, and it is only its preponderance *at or near the sea level* that indicates the region it belongs to. But its position at any given elevation at or above 2,500 feet is a guide to other regions.

## NATURAL HISTORY OF THE GREYWING AND REDWING PARTRIDGES OF SOUTH AFRICA.

By W. T. BLACK, SURGEON-MAJOR.

Family: *Tetraonidæ*, or Grouse. Sub-Family: *Perdicinæ*.

Genus and Species: *Francolinus afer*, Greywing Partridge; *Francolinus Le Naillartii*, Redwing Partridge.

The Cape Partridge is different from the English one, and is called a *Francolin*, and is distinguished by the larger and stouter beak, more developed tail, and generally by the strong spurs and tubercles on the tarsi or legs.

Mr. Stephens established this *genus* in 1819 (*General Zoology*, ix., p. 303), and it corresponds with the *Chætopus* of Swainson, *Pternistes* of Wagler, and *Rhizothera* of G. R. Gray; but the name is in use by older naturalists, as Dr. Sibley, 1801, and J. Shaw, *Zoological Lectures*, 1809. *Burchell*, in his travels in the Cape, does not mention the different varieties of Cape partridge, and does not use the term *Francolin*,—1822. The Redwing Partridge appears in a good coloured illustration in Dr. A. Smith's *Zoology of South Africa*, pl. 85; and in Gray's *Genera of Birds* there is a coloured figure of the *Francolinus Clappertoni*, another African species.

There is a specimen, stuffed, of the Redwing Partridge in the National Museum, Edinburgh, Bird Room, upstairs, Case 334, in good condition; and there are some in the Derby Museum, Liverpool; and I sent home a specimen for the Museum of Natural History, Manchester.

*Habits.*—The species are found in the warmer parts of the old world, especially in Africa. At the Cape of Good Hope they do not frequent agricultural lands, as at home, except corn lands, after harvest and gleaning, but are found generally in open grass countries, and have always some refuge near at hand to which they can fly when hunted, or crevices and holes in the rocks and coppices for the Greywing, and kloofy or clumpy bush for the Redwing Partridge. These two Francolins are ground birds, and do not perch, as do the other Francolins, called Pheasants at the Cape, but run with great swiftness through the long grass to their covers when not flushed by the dog; their flight then appears much the same as that of the English partridge, as they rise with a bound into the air, vigorously flapping their wings, up to a height of about six feet to ten feet, and then sail off at a low gradient, to alight further off, with wings passive and expanded. When members of covies are separated, they may be heard, after a time, here and there, especially in the evenings, calling to each other in the grass, in a low, piping voice, thus naturally betraying their whereabouts to the listening gunner, whose hopes again revive to get another shot. On the elevated highlands, after a snowfall in the winter months, advantage may be taken of it to find the covies huddled together for warmth, and not dispersed for feeding; but against this may be placed the disadvantage of the dogs being unable to take up the scent after the first flush from cover.

1. *Greywing Partridge.*—Length 12", wings 6", tail 3"; weight, 15 to 16 oz. It inhabits the grassy maritime districts of the Cape in great numbers, and frequents the scrubby and stony valley of the Fish River; and about Beaufort and the Winterberg is only found in the herbage of the mountain tops and elevated plateaux.

It is a smaller bird than the Redwing, plainer in plumage,

devoid of ornamental markings on the head and neck, but is more vigorous, gamy, and gregarious, and has a strong voice and powerful flight. It feeds on bulbs of the small grasses and weeds, which it digs up from the ground with its powerful arched beak, and on varieties of insects and beetles on the change of season, when the bulbs are useless from flowering. It is denominated Greywing from the ashy grey colour of the under parts of the wings. It forms nests among the bushes, of a loose structure of grass and roots, in a hollow of the soil; and its eggs, six to eight in number, vary in colour from a greenish brown to a dark brown, or light greenish, almost white, and spotted with small brown points.

The covies generally number about five to six brace, but several of these frequently pack together in the season to the amount of twenty or thirty brace, which may be generally found in dry, grassy valleys, and make a terrific screaming when they are flushed and scattered.

It feeds during the early morning and evening, during hot weather, and shelters itself from the heat of the sun under thick bushes, from which it rises readily, when disturbed, on the wing, but can, however, run with great swiftness on the ground; and a winged bird is sure to escape unless followed by a good dog in close pursuit.

*Anatomy.*—It has a strong gizzard, with a radiate muscle the crop and diverticulum are attached to the stomach. The larger are prominently large, and the left one is larger than the right. The lobes of the kidneys extend down the back of the abdomen, from the lungs to the pelvis. There are two bile ducts, the cystic for the gall bladder, and the hepatic for the liver, going to the first loop of the duodenum. The inferior vena cava enters the liver from behind on its course to the heart. Supra-renal capsules are well marked. Spleen is small, and lies behind the stomach, next the back.

Obturator Internus muscle, and accessory ones of the hip joint, are powerful. The uropygium gland opens by a papilla on to the skin amongst the feathers of the tail. Inferior larynx present, to account for its rapid scream.

*Redwing Partridge*.—Length 18", wing 6" 6', tail 8" 3'; weight, 20 to 21 oz. It much resembles the preceding species, but is easily distinguished by its larger size, darker and brighter markings on the plumage, by the uninterrupted broad rufous bands on the neck and head, and by black and white mottled collar, and stripes on the same parts. It is called Redwing from the rufous colours of the under surface of the wings. This very handsome bird is extremely local in the western districts of the Cape, and frequents isolated grassy dells, or secluded valleys between high mountain ranges, through which flows a clear rill of water. These birds may be found in the Palmiet rushes, which crowd the morasses formed by the overflowing waters of a stream, where they crouch amidst the coarse grass and reeds.

They lie very closely concealed, and on some occasions the grass has to be parted under the pointer's nose to allow the birds to escape; and if they are flushed a second time, and well marked down, they may often be caught by the hand, as they will hardly rise again.

In the eastern districts they affect the hill sides and grassy hollows on their summits; and the places in which they lived were always covered with long grass and rushes, indicating that these were always damper than the surrounding neighbourhood. Their covies do not amount to more than four to five brace; and they do not pack in large flocks, like the Greywing birds; and they may sometimes be seen walking through the grass with their heads up, looking round them, like poultry on a farm.

*Anatomy*.—The testes are small, and only about one-

sixteenth the size of those in the other species, which may be coincident with the greater productiveness and vigour of the greywing bird. The uropygium gland exists above the tail, as in the other. The inferior vena cava merely passes through the liver, receiving the hepatic veins. The cystic, hepatic, and pancreatic ducts enter the duodenum on the second curve. The spleen is small, and lies behind and between the stomach and liver, on the back of the abdomen. The duodenum has no villi on the mucous membrane, and its coats are thin. The lower parts of the ilium, rectum, and appendices coli have villous or papillated lining membranes. Supra-renal capsules are present. The kidneys are large; the lower larynx has well-developed muscular apparatus, to correspond with the vigorous screaming.

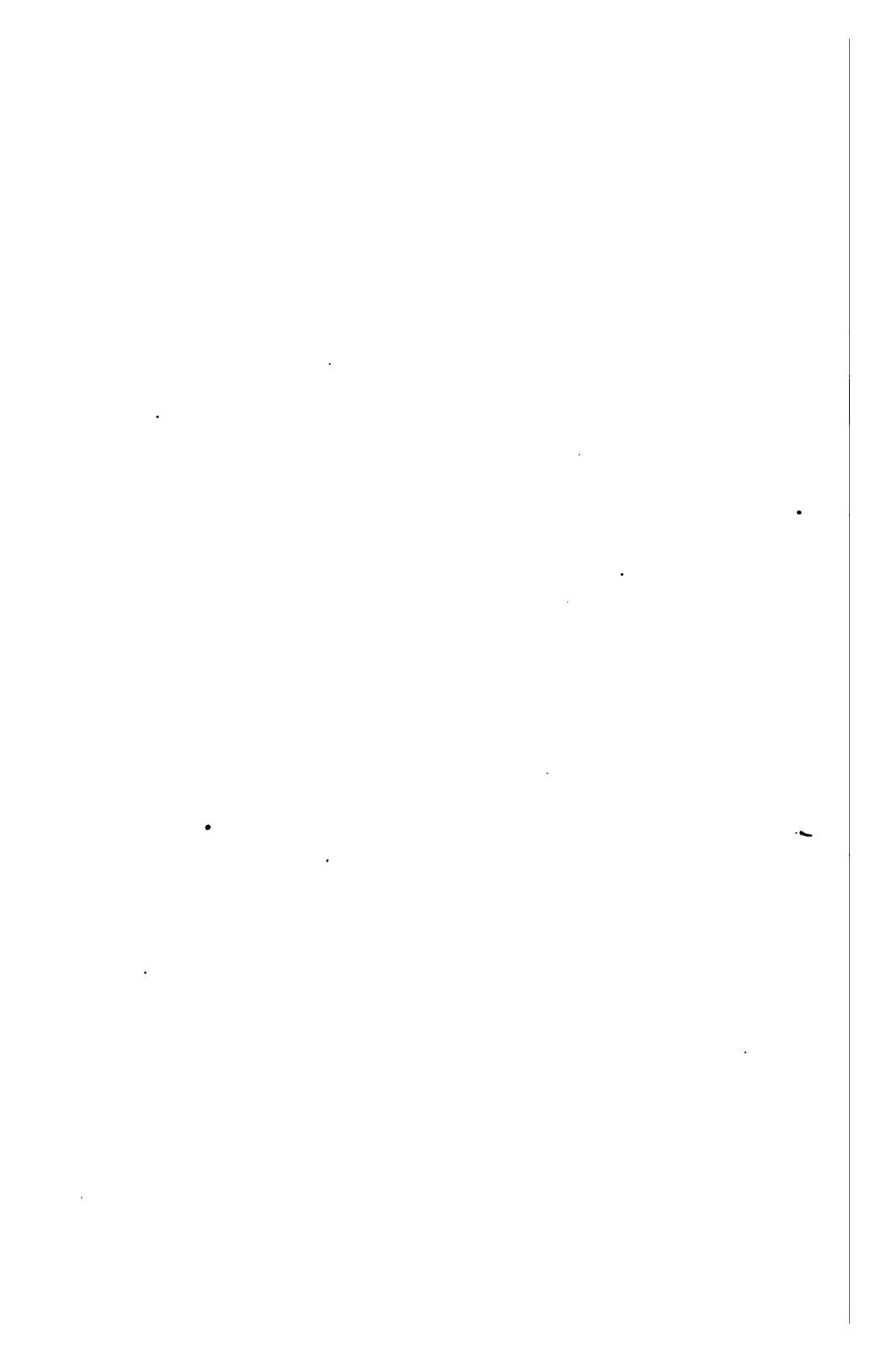
*Shooting Seasons.*—As the seasons are reversed in the southern hemisphere from what they are in the northern, so is this shooting season altered to the months of May, June and July, corresponding to their winter, when the birds are full grown and strong in covey, and are well fed after the harvest.

*The Breeding Season* commences from August, when the birds begin to pair off and scatter, and all shooting then completely terminates; but the game license, value 7s. 6d., operative over the settled districts, however, only sanctions its prosecution from December 1st to June 30th of following year.

*Domestication.*—It would be quite possible to capture and rear, without much difficulty, broods of the Redwing Partridge, as it is not nearly so wild a bird as the Greywing, and settles itself in country frequented by sheep and cattle, and likes sheltered places of residence, and a fixed habitation and feeding ground. They are fine, plump, well-fed birds, of good weight, handsome appearance and erect car-

riage, and would look well in a paddock or farm-steading, and are as substantial eating and juicy flavour as any well-bred poultry in this country, and therefore are strongly recommended as suitable for domestication.

**LIVERPOOL:**  
**D. MARPLES AND CO., LIMITED, PRINTERS,**  
**LORD STREET.**





Literary and Philosophical Society of Liverpool.

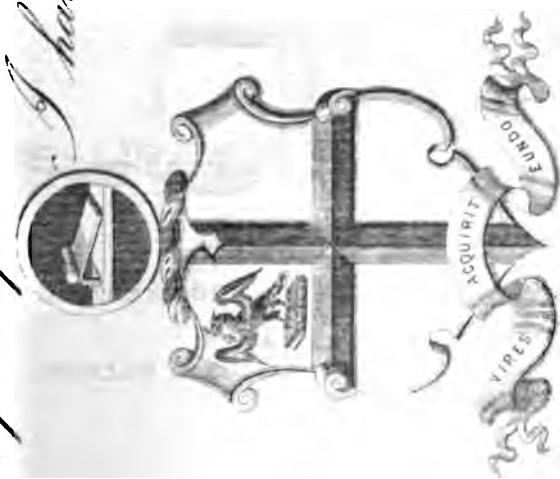
ROYAL LIBRARY

Sir,

i - ii - 1078

I am directed by the Council  
to forward Vol. xxxi. of the Proceedings of  
this Society as a donation to the Library of  
Harvard University.

I beguest the favour of your acknowledgement  
of receipt



I have the honour to be

Sir,  
Your obedient Servt,

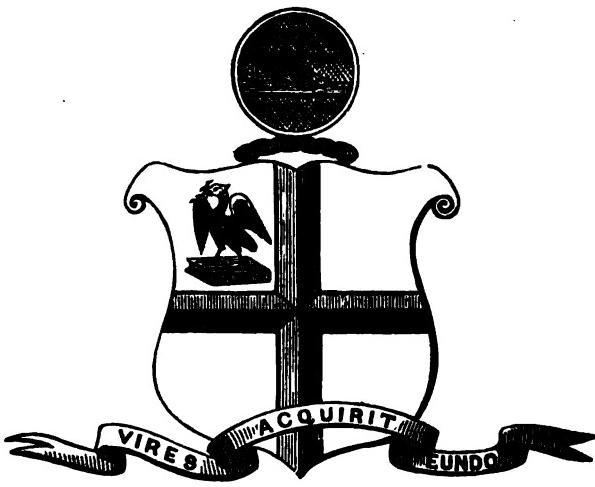
Asaph Morgan

Honorary Librarian.

To Skangdon-Sibley Mr. & Mrs.



◎ PROCEEDINGS  
OF THE  
LITERARY AND PHILOSOPHICAL SOCIETY  
OF  
LIVERPOOL, Eng. — A  
DURING THE  
SIXTY-SIXTH SESSION, 1876-77.  
No. XXXI.



X  
LONDON:  
LONGMANS, GREEN, READER, & DYER.  
LIVERPOOL:  
D. MARPLES & CO., LIMITED, LORD STREET.

1877.

~~23~~

~~XX.71~~

L Soc 1816.5

1878. May 1,

*edited  
by  
the Society*

This Volume has been edited by the Honorary Secretary.

The Authors have revised their Papers.

The Authors alone are responsible for facts and opinions.

The Society exchanges Proceedings with other publishing bodies, through the Librarian, from whom back numbers may be obtained.

## CONTENTS.

---

	PAGE
COUNCIL .....	vii
LIST OF MEMBERS .....	viii
HONORARY MEMBERS .....	xx
CORRESPONDING MEMBERS.....	xxii
ASSOCIATES .....	xxiii
ADDITIONS TO THE LIBRARY .....	xxiv
LIST OF SOCIETIES, ETC., TO WHICH THIS VOLUME IS PRESENTED .....	xI
BALANCE SHEET .....	xlv
ANNUAL MEETING—REPORT .....	xlvii
ELECTION OF COUNCIL.	
RE-ELECTION OF ASSOCIATES.	
PRESIDENT'S INAUGURAL ADDRESS ON THE PRESENT STATE OF LINGUISTIC SCIENCE.	
FIRST ORDINARY MEETING .....	li
Conversazione on Natural Science.	
Argo Collection.	
On the Sponges of the "Argo" Expedition, by Mr. THOS. HIGGIN.	
On lower Cryptogamic Plants, etc., of the "Argo" Expedition, by the Rev. H. H. HIGGINS, M.A.	
On the subject of the Passage of Plants across the Atlantic, by the Rev. H. H. HIGGINS, M.A.	
Summary of the Fishes of the "Argo" Expedition, by Mr. THOMAS J. MOORE.	

	PAGE
<b>SECOND ORDINARY MEETING .....</b>	lxiii
Discussion on Discovery of Fossil Corals and Coal at Disco Island.	
Major-General Bellasis' Collection of Arms, &c., from Mooltan.	
Specimen of Manganese, exhibited by Dr. WHITTLE.	
Specimen of Gallium, exhibited by Mr. STEARN.	
Rev. T. P. KIRKMAN, M.A., F.R.S., on "How we Come to Know."	
<b>THIRD ORDINARY MEETING .....</b>	lxii
Specimens of Isopod Crustaceans from Jamaica, collected by Capt. PERRY, exhibited by Mr. T. J. MOORE.	
Mr A. J. MOTT, on "Haeckel's History of Creation."	
<b>FOURTH ORDINARY MEETING .....</b>	lxiii
Photographs of Title Pages of two of the earliest Books printed in Liverpool, exhibited by Mr. J. A. PICTON, F.S.A.	
Extract of a letter from Berlin, describing the Young Gorilla, read by Mr. ALFRED HIGGINSON.	
<b>EXTRAORDINARY MEETING.....</b>	lxiv
Proposed Alteration of Laws.	
<b>FIFTH ORDINARY MEETING .....</b>	lxv
<i>Britain's Remembrancer</i> , exhibited by Mr. J. A. PICTON, F.S.A.	
Browning's Akribetic Galvanometer on Ridout's Patent, exhibited by Mr. LEWIS HUGHES.	
Cape Diamond, exhibited by Mr. T. J. MOORE.	
Sprengel Vacuum Pumps of improved form, exhibited by Mr. C. H. STEARN.	
Mr. JOSIAH MARPLES, on "Type Founders and Type Founding."	

## CONTENTS.

iii

	PAGE
<b>EXTRAORDINARY MEETING .....</b>	<b>lxvi</b>
Proposed Alteration of Laws.	
<b>SIXTH ORDINARY MEETING .....</b>	<b>lxvi</b>
Autotype Reproduction of John Milton's "Common Place Book," exhibited by Mr. JOHN MILLER.	
Mr. J. LINTON PALMER, on "The Marquesans—their History, Traditions, and Customs."	
<b>EXTRAORDINARY MEETING .....</b>	<b>lxvi</b>
Proposed Alteration of Laws.	
<b>SEVENTH ORDINARY MEETING .....</b>	<b>lxvii</b>
Discussion on Mr. MOTT'S Paper on "Haeckel's History of Creation."	
<b>EIGHTH ORDINARY MEETING.....</b>	<b>lxvii</b>
Patent Electric Pen, exhibited by Mr. CHANTRELL.	
MR. JOSEPH BOULT, F.R.I.B.A., on "The Suffix -ster."	
<b>NINTH ORDINARY MEETING .....</b>	<b>lxviii</b>
Extracts from a letter from Mr. John Adams, of Pitcairns Island, relative to the Sea Serpent, read by Mr. J. LINTON PALMER, R.N.	
Mr. EDWARD DAVIES, F.C.S., on "Popular Errors about Poisons."	
<b>TENTH ORDINARY MEETING .....</b>	<b>lx</b>
Double Oscillating Pendulums for recording Lissajous' Curves, exhibited by Mr. JOSEPH MARPLES.	
Rev. T. P. KIRKMAN, M.A., F.R.S., on "The First Definition of the Scholastic Philosophy."	
<b>ELEVENTH ORDINARY MEETING.....</b>	<b>lxx</b>
Selection from a Collection of Specimens made by Capt. CAWNR WARREN; exhibited by Mr. T. J. MOORE, and described by Capt. WARREN.	
Classification of the <i>Alyza</i> , <i>Zoophytes</i> , and <i>Polyzoa</i> , by Miss GATTY.	

	PAGE
Specimens collected by Capt. SLACK, exhibited by Mr. T. J. MOORE.	
List of Algae and Polyzoa in the collection, by Miss GATTY.	
Marine Organisms, collected by Capt. J. H. MORTIMER, exhibited by Mr. T. J. MOORE.	
Notes on <i>Physalia</i> , by Capt. MORTIMER, with remarks by Mr. W. J. SOLLAS, F.G.S., &c.	
Mr. G. H. MORTON, F.G.S., on "The Introduction of Geological Maps."	
Dr. NEVINS, on "The Translation of Συνίημι and its forms, and of Ἰα μὴ with a subjunctive mood, in the Authorised Version of the New Testament."	
TWELFTH ORDINARY MEETING.....	lxxviii
Roll of Liverpool Volunteers in 1797, exhibited by J. A. PICTON, F.S.A.	
Discourse delivered by Wm. Roscoe, on the opening of the Royal Institution, 25th Nov., 1817. Presented by Mr. ALFRED HIGGINSON.	
Mr. ALFRED MORGAN, on the "Origin and Progress of the United States Geological and Geographical Survey of the Territories."	
Mr. MALCOLM GUTHRIE, on "The Causalational Theory of Volition—a Reply to Strictures in Dr. Carpenter's Mental Physiology."	
THIRTEENTH ORDINARY MEETING.....	lxix
Rev. H. H. HIGGINS, M.A., "Liverpool Museum Report, No. 1, devoted to the Mollusca of the Argo Expedition to the West Indies."	
Mr. E. R. RUSSELL, on "The Autobiography and Memorials of Miss Martineau."	

## CONTENTS.

▼

	PAGE
<b>FOURTEENTH ORDINARY MEETING .....</b>	<b>lxix</b>
Notes on Lepidopterous Cocoons and Larva Cases from São Paulo, Brazil, by Mr. E. DUKINFIELD JONES (with a plate).	
Mr. ALFRED MORGAN, on "The Cliff Houses and Antiquities of Colorado and New Mexico" (with a map and two plates).	
Mr. J. C. REDISH, on "The Silver Question."	

## PAPERS PRINTED.

	PAGE
Mr. J. A. PICTON, F.S.A.—President's Address—"On the Present State of Linguistic Science" .....	1
Rev. T. P. KIRKMAN, M.A., F.R.S.—"How we Come to Know" .....	808
Mr. A. J. MOTT.—On "Haeckel's History of Creation" ...	41
Dr. NEVINS.—"On some Phases of Modern French Thought"	123
Mr. JOSIAH MARPLES.—"On Type Founders and Type Founding" (with illustrations). ....	147
DISCUSSION of Mr. Mott's Paper "On Haeckel's History of Creation" .....	91
Mr. JOSEPH BOULT, F.R.I.B.A.—"On the Suffix -ster".....	245
Mr. EDWARD DAVIES, F.C.S.—"Popular Errors about Poisons" .....	817
Rev. T. P. KIRKMAN, M.A., F.R.S.—"The First Definition of the Scholastic Philosophy".....	229
Mr. G. H. MORTON, F.G.S.—"The Introduction of Geological Maps" .....	293
Dr. NEVINS.—"On the Translation of Συνίημι and its forms, and of Ἰα μὴ with a subjunctive mood, in the Authorised Version of the New Testament" .....	167

	PAGE
Mr. ALFRED MORGAN.—“Origin and Progress of the United States Geological and Geographical Survey of the Territories” .....	357
Rev. H. H. HIGGINS, M.A.—“Liverpool Museum Report, No. 1” (with a coloured plate).....	405
Mr. E. R. RUSELL.—“The Autobiography and Memorials of Miss Martineau ”.....	185
Mr. ALFRED MORGAN.—“The Cliff Houses and Antiquities of Colorado and New Mexico” (with three plates) .....	348
Mr. J. C. REDISH.—“The Silver Question ”.....	367

SESSION LXVI., 1876-77.

---

*President.*

JAMES ALLANSON PICTON, F.S.A.

*Ex-Presidents.*

Rev. J. MARTINEAU, D.D., LL.D.	Rev. C. D. GINSBURG, LL.D.
Rev. J. BOOTH, LL.D., F.R.S.	JOHN BIRKBECK NEVINS, M.D.
Rev. H. H. HIGGINS, M.A.	ALBERT JULIUS MOTT.
WILLIAM IHNE, Ph.D.	

*Vice-Presidents.*

ALFRED HIGGINSON, M.R.C.S.
THOS. J. MOORE, COR. MEM. Z.S.L.
JOHN J. DRYSDALE, M.D., M.R.C.S.

*Honorary Treasurer.*

RICHARD C. JOHNSON, F.R.A.S.

*Honorary Secretary.*

JAMES BIRCHALL.

*Honorary Librarian.*

ALFRED MORGAN.

*Council.*

J. CAMPBELL BROWN, D.Sc., &c.	GEORGE H. MORTON, F.G.S.
ALFRED E. FLETCHER, F.C.S.	BARON LOUIS BENAS.
W. CARTER, M.B.	THOMAS HIGGIN, F.L.S.
REV. E. M. GELDART, M.A.	J. L. PALMER, F.S.A., F.R.G.S.
EDWARD R. RUSSELL.	JOSIAH MARPLES.
EDWARD DAVIES, F.C.S.	JOHN W. HAYWARD, M.D.
C. H. STEARN.	SIBLEY HICKS, F.R.C.S.

## ORDINARY MEMBERS,

ON THE SOCIETY'S ROLL AT THE CLOSE OF THE 66TH SESSION,

CORRECTED TO JUNE, 1877.

---

*Life Members are marked with an Asterisk.*

---

- Oct. 21, 1872 Abbott, Joseph, B.A., 2, *Picton Street, Wavertree-road, and Liverpool College, Shaw-street, Everton.*
- Oct. 11, 1838 Aikin, James, 4, *Gambier-terrace.*
- Nov. 4, 1867 Allen, John Fenwick, *Peaseley Vale, St. Helens.*
- March 7, 1864 Archer, F., B.A. Trin. Col. Cantab., *Boundary Cottage, Little Crosby.*
- \*Nov. 28, 1853 Archer, T. C., F.R.S.E., F.R.S.S.A., Director of the Industrial Museum, *Edinburgh.*
- Dec. 14, 1863 Ashe, Theop. Fielding, 9-15, *Atherton-street.*
- Feb. 22, 1855 Avison, Thomas, F.S.A., 18, *Cook-street, and Fullwood Park, Aigburth.*
- Jan. 11, 1864 Bagshaw, John, 87, *Church-street, and 26, Bent-leys-road, Prince's Park.*
- May 4, 1863 Bailey, Fras. J., L.R.C.P., 51, *Grove-street.*
- Nov. 18, 1876 Ball, Geo. Hy., *The Priory, St. George's Mount, New Brighton.*
- April 20, 1874 Barton, Rev. John, M.A., *Vicarage, Rainhill.*
- Nov. 15, 1869 Beer, Joseph B. de, *Northern Assurance Chambers, Tithebarn-street.*
- March 9, 1857 Bell, Christopher, *Redcross-street, and 55, Hamilton-square, Birkenhead.*

- Jan. 11, 1875 Bell, Wilson, 1, *Laburnum Villas, Egerton-street, New Brighton.*
- Feb. 22, 1875 Bellew, Thomas A., *Cunard Mail Office, 8, Water-street.*
- Nov. 15, 1875 Bellis, William, *Sunny Bank, Victoria Park, Wavertree.*
- Dec. 10, 1866 Benas, Baron Louis, 5, *South Castle-street.*
- Nov. 27, 1865 Biggs, Arthur Worthington, 28, *Exchange Street East, and 11, Percy-street.*
- Feb. 6, 1872 Biggs, John H. W., 6, *Windsor-buildings, George-street.*
- Oct. 81, 1859 Birch, Jas. (Messrs. Reiss Bros.), 12, *The Temple.*
- Jan. 25, 1864 Birchall, James, Governor of the Liverpool Industrial Schools, *Kirkdale, HON. SECRETARY.*
- Dec. 14, 1874 Black, Rev. R., M.A., 26, *Falkner-street.*
- March 9, 1866 Blood, William, *Chamber of Commerce, and Greta Mount, 5, Woodchurch-road, Birkenhead.*
- Nov. 26, 1866 Boult, Joseph, 15D, *Exchange-buildings, W.*
- Oct. 19, 1868 Bower, Anthony, *Vauxhall Foundry, and Bowersdale, Seaforth.*
- Oct. 21, 1872 Bowring, C. T., *Elmsleigh, Prince's Park, and 20, Lancaster-buildings, Tithebarn-street.*
- Dec. 15, 1873 Brass, Joseph, M.D., 6, *Upper Parliament-street.*
- Nov. 4, 1867 Bramwell, Ed., *Cowley Hill, St. Helens.*
- Jan. 27, 1873 Bremner, H. H., 15, *Lord-street.*
- Nov. 12, 1866 Browne, Edgar A., 86, *Bedford-street South.*
- Oct. 18, 1869 Brown, Dr. J. Campbell, D.Sc., F.C.S., *School of Medicine, Dover-street.*
- Oct. 80, 1876 Bulman, Richard (Messrs. Baker, Bulman & Co.), 2, *India-buildings, Water-street.*
- Feb. 4, 1867 Burden, Edward, 128, *Upper Parliament-street.*
- Nov. 12, 1866 Butler, Rev. George, *The College, Shaw-street.*
- April 18, 1864 Burne, Joseph, *Royal Insurance Office, 1, North John-street and Higher Tranmere.*
- \*May 1, 1848 Byerley, Isaac, F.L.S., F.R.C.S., *Victoria-road, Seacombe.*

- Nov. 8, 1862 Cameron, John, M.D., M.R.C.P., Physician to the Southern Hospital, and Lecturer on Medicine at the Royal Infirmary School of Medicine, 17, Rodney-street.
- Dec. 2, 1872 Carey, Eustace, *Appleton-in-Widnes, near Warrington.*
- Jan. 9, 1865 Cariss, Astrup, 40, *Castle-street.*
- Nov. 18, 1876 Carson, Thomas, M.D., 822, *Upper Parliament-street.*
- Mar. 4, 1872 Carter, W., M.B.Lond., 74, *Rodney-street.*
- Dec. 2, 1861 Chadburn, William, 71, *Lord-street.*
- April 8, 1876 Chantrell, G. F., 1, *St. James's Mount.*
- Feb. 22, 1875 Chapman, Thomas, *Oaklynne, Parkfield-road, Prince's Park.*
- Oct. 18, 1869 Cook, Henry James, *Byrom-street, and Burbo House, Blundell Sands.*
- Dec. 18, 1875 Cowell, Peter, *Free Library, William Brown-street.*
- Oct. 6, 1868 Crosfield, William, Jun., 28, *Temple Court, and Alexandra-drive, Ullet-road.*
- Dec. 14, 1868 Daly, Dennis, 11, *Rumford street.*
- Nov. 12, 1866 Davies, E., F.C.S., *The Laboratory, Royal Institution, Colquitt-street.*
- Nov. 2, 1868 Dawbarn, William, *The Temple, Dale-street, and Mossley-hill.*
- Oct. 20, 1878 Day, George, 28, *Brunswick-street, and Abbey Cottage, Aintree.*
- Oct. 1, 1866 Dawson, Thomas, 26, *Rodney-street.*
- April 6, 1874 Dodd, John, 6, *Thomas-street, and 2, Derby-terrace, Rock Ferry.*
- Nov. 27, 1868 Dove, John M., *Claughton.*
- Nov. 1, 1875 Doyle, Jas. F., 4, *Harrington-street, and Merton-road, Bootle,*
- Jan. 28, 1848 Drysdale, John James, M.D.Edin., M.R.C.S. Edin., 86, *Rodney-street.*
- Feb. 4, 1856 Duckworth, Henry, F.L.S., F.R.G.S., F.G.S., 82, *Brown's-buildings, Exchange-street, W.*

- Nov. 1, 1875 Edmunds, William, *Edmond-street Chambers, Edmond-street.*
- \*Nov. 27, 1848 Edwards, J. B., Ph.D. Gies, F.C.S., Professor Medical Faculty of Bishop's College, *Montreal.*
- Mar. 21, 1870 Edwards, Edward E. (Smith, Edwards & Co.), *Adelaide-buildings, 4, Chapel-street.*
- Feb. 24, 1868 Elliot, John, *85, Peter's-lane.*
- April 7, 1862 English, Charles J., *26, Chapel-street, and 26, Falkner-square.*
- April 20, 1874 English, Robert A., *26, Falkner-square.*
- \*Dec. 18, 1852 Ferguson, William, F.L.S., F.G.S., *Kinmundy House, near Mintlaw, N.B.*
- Oct. 1, 1866 Fletcher, Alfred E., F.C.S., H.M. Inspector of Alkali Works for the Western District, *5, Edge-lane.*
- Nov. 15, 1875 Fleming, E. L., F.C.S., *Borax Works, Old Swan.*
- \*Mar. 19, 1855 Foard, James Thomas, *5, Essex-ct., Temple, E.C.*
- Dec. 2, 1872 Forwood, Wm. Bower (Messrs. Leech, Harrison and Forwood), *16, Queen-buildings, 11, Dale-street, and Burbo Bank-road, Blundell Sands.*
- Nov. 16, 1874 Fothergill, Charles George, *Gambier-terrace.*
- Jan. 12, 1874 Frost, John Pownall, *10, North John-street.*
- Feb. 19, 1877 Gardner, Rev. Henry, *The Hamlet, Belvidere-road.*
- Nov. 29, 1875 Gardner, William, *Ash Lea, Oak-hill Park.*
- \*Feb. 6, 1854 Gee, Robert, M.D. Heidelb., M.R.C.P., Lecturer on Diseases of Children, Royal Infirmary School of Medicine; Physician Workhouse Hospital, *5, Abercromby-square.*
- Nov. 8, 1878 Geldart, Rev. E. M., M.A.
- Nov. 14, 1858 Greenwood, Henry, *82, Castle-street, and Stanley Park.*
- Nov. 16, 1874 Grindley, Benjamin H., *Albion Office, Sir Thomas' Buildings.*
- Dec. 14, 1874 Gunn, Rev. W. E. B., M.A., *8, Blackburne-terrace, Blackburne-place.*

- Nov. 16, 1874 Guthrie, Malcolm, 31, *Stanley-road, Bootle.*  
Jan. 22, 1855 Hakes, James, M.R.C.S., Surgeon to the Northern  
Hospital, 30, *Hope-street.*  
Oct. 18, 1875 Hale, Philip A., Bank of England, *Castle-street.*  
Oct. 21, 1872 Halliwell, Joseph, 10, *College-lane.*  
\*Jan. 21, 1856 Hardman, Lawrence, 85, *Rock Park, Rock  
Ferry.*  
Dec. 18, 1875 Harpin, E., 46, *Onslow-road, Elm Park, Fairfield.*  
Nov. 15, 1869 Hartwig, Estevan H. L., 62, *Palmaille, Antona,  
Hamburg.*  
Nov. 80, 1874 Harvey, Henry, M.B., *High-street, Wavertree.*  
Feb. 6, 1865 Hassan, Rev. E., *Alma-terrace, Sandown-lane.*  
Nov. 18, 1865 Hayward, John Williams, M.D., 117, *Grove-street.*  
Feb. 6, 1865 Hebson, Douglas, 18, *Tower Chambers, and 58,  
Bedford-street South.*  
Nov. 4, 1872 Hicks, Sibley, F.R.C.S., 2, *Erskine-street.*  
Dec. 28, 1846 Higgins, Rev. H. H., M.A. Cantab, F.C.P.S.,  
*Rainhill, Ex-PRESIDENT.*  
\*Oct. 31, 1886 Higginson, Alfred, M.R.C.S., 185, *Tulse Hill,  
London.*  
March 22, 1869 Higgin, Thomas, F.L.S., 88, *Tower-buildings, and  
Huyton.*  
Nov. 16, 1868 Holden, Adam, 48, *Church-street, and 2, Carlton-  
terrace, Milton-road.*  
March 9, 1868 Holme, James, 10, *Huskisson-street, and Eldon  
Chambers, South John-street.*  
Nov. 80, 1874 Holme, Rev. Arthur P., *Tattenhall, near Chester.*  
\*Dec. 14, 1862 Holt, Robert Durning, 6, *India-buildings, and 29,  
Edge-lane.*  
April 9, 1877 Hooper, Richard Bennett, 6, *Loudon Grove,  
North Hill-street.*  
Jan. 24, 1876 Hughes, Lewis, 88, *St. Domingo Vale, Everton.*  
\*Nov. 18, 1854 Hunter, John, Member Historic Society, Pennsyl-  
vania, *Halifax, Nova Scotia.*  
Dec. 18, 1875 Hutchinson, Joseph B., M.R.C.S., 77, *Upper  
Parliament-street.*

- Jan. 26, 1857 Hutton, David, 8, *St. George's-crescent*, and 61, *Canning-street*.
- \*April 29, 1850 Ihne, William, Ph.D., Bonn, *Villa Felseck, Heidelberg*, Ex-PRESIDENT.
- Feb. 28, 1857 Imlach, Henry, M.D.Edin., 1, *Abercromby-square*.
- Oct. 19, 1874 Imlach, Francis, M.B., 1, *Abercromby-square*.
- Oct. 20, 1878 Johnson, Digby, Royal Insurance Office, North John-street.
- March 10, 1862 Johnson, Richard, *Queen-buildings*, and *Higher Bebington Hall, Bebington*.
- Jan. 26, 1868 Johnson, Richard C., F.R.A.S., *Queen-buildings Dale-street*, and *Higher Bebington*, HON. TREASURER.
- Oct. 80, 1876 Johnson, James Henry, F.G.S., 64, *Albert-road, Southport*.
- Mar. 19, 1877 Johnson, [Rev. H. I., M.A., *Royal Institution School*, and *Penrhyn House, Ullet-road*.
- Feb. 24, 1868 Jones, Charles W., 8, *Childwall-road, Wavertree*.
- \*April 4, 1852 Jones, Morris Charles, F.S.A., F.S.A.Scot., 20, *Abercromby-square*.
- Oct. 18, 1869 Jones, William Bolton, 21, *South Castle-street*.
- Nov. 80, 1874 Joseph, Rev. Morris, 67, *Canning-street*.
- Oct. 2, 1865 Kendal, Robinson, 16, *Water-street*, and 178, *Bedford-street*.
- Nov. 15, 1869 King, Jos., 18, *Exchange-alley W.*, and *Trelearan House, Blundell Sands*.
- Nov. 1, 1869 Kinsman, W. N., 8, *Derwent-road, Stoneycroft*.
- \*Jan. 14, 1899 Lassell, William, F.R.SS. L. and E., F.R.A.S., 27, *Milton-street*, and *Wapping*.
- Oct. 21, 1844 Lear, John, *Stoney Cottage, Stoney Green, New Brighton*.
- Nov. 8, 1878 Lee, Hamilton (Messrs. Lee & Nightingale), North John-street.
- Nov. 8, 1878 Lee, Harold (Messrs. Lee & Nightingale), North John-street.

- Dec. 11, 1871 Leigh, Richmond, M.R.C.S.E., 141, Park-road.  
Nov. 1, 1875 Lutschaunig, Alfred, Cable-street.  
April 17, 1865 MacCheane, Wm., M.R.C.S., 47, Shaw-street.  
Oct. 80, 1876 McGrath, —, M.D., 12, Alfred-street, Great George-street.  
April 20, 1868 Marples, David, Lord street and Cable-street, and 5, Mount Grove, Oxton, Birkenhead.  
Nov. 14, 1870 Marples, Joseph, 28, Leece-street, and Carlton-road, Tranmere.  
Nov. 17, 1878 Marples, Josiah, Melvill Chambers, Lord-street, and Broomfield, Egremont.  
Feb. 19, 1877 Marples, William, 9, North John-street.  
Feb. 9, 1874 Marsden, Peter Crook, Lymefield, Heaton, near Bolton.  
Feb. 24, 1868 Marsh, John, Ran Lee, Rainhill.  
Jan. 21, 1889 Martin, Studley, 27, Brown's-buildings, and 177, Bedford-street South.  
Feb. 20, 1871 Mason, Alfred H., F.C.S., Lond. & Berlin, 56, Hanover-street.  
Nov. 2, 1874 Matheson, Rev. A. Scott, Dunneyat, Stanley-road, Bootle.  
Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.A.S., F.E.S. Pennant House, Lower Bebington.  
Nov. 17, 1878 Mellor, James, Jun., Sefton House, Great Crosby.  
Dec. 14, 1874 Mellor, John, 2, Church-road, Walton.  
Oct. 81, 1859 Moore, Thomas John, Corr. Mem. Z.S.L., Curator Free Public Museum, William Brown-street, VICE-PRESIDENT.  
Nov. 15, 1869 Morgan, Alfred, 126, London-road, and 2, Rathbone-terrace, Wellington-road, Wavertree, Hon. LIBRARIAN.  
Jan. 8, 1855 Morton, George Highfield, F.G.S., 122, London-road.  
April 16, 1849 Moss, Rev. John James, B.A., Upton, Cheshire.  
Oct. 29, 1850 Mott, Albert Julius, 82, Church-street, and Adscott-court, Westbury-on-Severn, Ex-PRESIDENT.

- April 8, 1854 Mott, Charles Grey, 27, *Argyle-street, Birkenhead, and Cavendish-road, Birkenhead Park.*
- Mar. 28, 1874 McCulloch, D. B., 28, *Queen-buildings, Dale-street.*
- \*Oct. 21, 1867 Muspratt, E. K., *Seaforth Hall, Seaforth.*
- Oct. 20, 1865 Nevins, John Birkbeck, M.D.Lond., M.R.C.S., Lecturer on *Materia Medica*, Royal Infirmary School of Medicine, 8, *Abercromby-square, Ex-PRESIDENT.*
- Feb. 6, 1865 Newton, John, M.R.C.S., 20, *Marmaduke-street, Edge-hill.*
- Oct. 30, 1876 Nickson, John Horatio, 147, *Grove-street.*
- Nov. 2, 1868 Norrie, Rev. B. A. W., M.A. Cantab., *The College School, Huyton.*
- \*Oct. 15, 1855 North, Alfred, 28, *Landsdown-Crescent, Notting-hill, London, W.*
- Jan. 8, 1877 Ogston, James, *Maresfield, Wavertree.*
- Dec. 18, 1866 Owen, Peter (Farnworth & Jardine), *Liverpool and London-Chambers.*
- Feb. 21, 1870 Packer, James Macnamara, M.D., *Rose Cottage, Poplar Bank, Huyton.*
- Nov. 2, 1874 Palmer, John Linton, F.S.A., F.R.G.S., Fleet Surgeon R.N., 24, *Rock Park, Rock Ferry.*
- Dec. 15, 1878 Parnell, E. W., 19, *Deane-road, Edge-lane.*
- Nov. 16, 1874 Parratt, John, *Waterloo.*
- Mar. 8, 1869 Parratt, Thomas P., *Silverton, North Crosby-road, Waterloo.*
- Mar. 19, 1877 Parry, J. F., *Sandon-terrace.*
- Jan. 9, 1871 Patterson, John, 16, *Devonshire-road, Prince's Park.*
- Nov. 4, 1861 Philip, Thomas D., 48, *South Castle-street, and Holly-road, Fairfield.*
- Dec. 28, 1846 Picton, James Alanson, F.S.A., Chairman of the Library and Museum Committee, 11, *Dale-street, and Sandy Knowe, Wavertree, PRESIDENT.*

- Nov. 1, 1875 Picton, William Henry, *The Pines, Bromborough-road, Lower Bebington.*
- Nov. 16, 1874 Pim, Edward, 41, *Tithebarn-street.*
- April 30, 1866 Prag, Rev. Jacob, 99, *Upper Warwick-street.*
- Mar. 18, 1872 Pringle, Adam, *Grove Park.*
- Nov. 18, 1871 Proctor, Peter, M.R.C.S., and L.S.A.Lond., 18, *St. James-road.*
- Nov. 1, 1875 Prytherch, John, M.D., *Mitford-street, Netherfield-road North.*
- \*Jan. 22, 1866 Raffles, William Winter, 54, *Brown's-buildings, and Sunnyside, Prince's Park.*
- Nov. 12, 1860 Rathbone, Philip H., *Liverpool and London Chambers (H), and Greenbank Cottage, Wavertree.*
- March 24, 1862 Rathbone, Richard Reynolds, 17, *Lancaster buildings, Tithebarn-street, and Beechwood House, Grassendale.*
- \*Jan. 7, 1856 Rawlins, Charles Edward, 12, *Rumford-court, Rumford-place, and Rock Mount, Rainhill.*
- Jan. 9, 1870 Rawlins, Gerald W., *Brook Cottage, Rainhill.*
- Nov. 17, 1851 Redish, Joseph Carter, *Lyceum, Bold-street.*
- Jan. 10, 1876 Reid, Alexander, Royal Insurance Office, *North John-street.*
- Dec. 12, 1870 Rickard, Wm., LL.D., *Alverton House, 86, Upper Parliament-street.*
- Feb. 19, 1877 Rich, J. D., *General Post Office, and Ivy Lodge, Linnet-lane.*
- Jan. 11, 1875 Richardson, Joseph (Messrs. Laces & Co.), *Union-court, and 98, Bedford-street South.*
- Nov. 29, 1869 Roberts, Isaac, F.G.S., 26, *Rock Park, Rock Ferry.*
- Dec. 4, 1876 Roberts, Richard (Messrs. Roberts & Son), 18, *Hackin's-hoy, and Mossley-hill.*
- Feb. 4, 1867 Robinson, Joseph F., 1, *Knowsley-buildings, Tithebarn-street.*
- Oct. 4, 1869 Rogers, J. Frederick, 7, *Victoria-street, and 22, Ullet-road, Prince's Park.*

- Jan. 10, 1876 Rogerson, George Russell, F.R.A.S., F.R.G.S.,  
*Union Court, and Allerton.*
- April 18, 1854 Rowe, James, 16, *South Castle-street, and 105,  
Shaw-street.*
- Jan. 22, 1872 Russell, Edward R., "Daily Post," *Lord-street.  
and 58, Bedford-street.*
- \*Feb. 20, 1865 Samuel, Albert H., *Cumberland-terrace, Upper  
Parliament-street.*
- Feb. 19, 1877 Samuel, Douglas Ralph, 28, *Mount Pleasant,  
Waterloo.*
- April 7, 1862 Samuel, Harry S., 11, *Orange-court, and 2,  
Canning-street.*
- Nov. 30, 1874 Samuel, William Hy., 145, *Upper Parliament-  
street.*
- Mar. 19, 1866 Sephton, Rev. John, M.A., *Liverpool Institute.*
- Nov. 2, 1868 Sharp, Charles, *Liverpool Institute.*
- Nov. 16, 1868 Sheldon, E.M., M.R.C.S., 228, *Boundary-street.*
- Oct. 29, 1866 Shimmin, Hugh, 56, *Cable Street, and Tue Brook,  
West Derby.*
- Oct. 18, 1875 Simpson, James, 10, *Rumford-place.*
- Nov. 7, 1864 Skinner, Thomas, M.D.Edin., *Dunedin House,  
64, Upper Parliament-street.*
- Dec. 10, 1866 Smith, Elisha (Henry Nash & Co.), 12, *Tower-  
buildings North.*
- April 4, 1870 Smith, James, 9, *Lord-street, and Ribblesdale  
Villas, 22, Merton-road, Bootle.*
- Feb. 28, 1868 Smith, J. Simm, Royal Insurance Office, *Blount  
House, Croydon.*
- Feb. 24, 1862 Snape, Joseph, Lecturer on Dental Surgery,  
Royal Infirmary School of Medicine, 75,  
*Rodney-street.*
- April 20, 1874 Snow, Rev. T., M.A., 55, *Seel-street.*
- Jan. 24, 1876 Souttar, Robinson, Tramway Company, 8, *Castle-  
street, and 18, Christchurch-road, Claughton-  
Birkenhead.*
- Nov. 12, 1860 Spence, Charles, 4, *Old Hall-street.*

- Feb. 10, 1862 Spence, James, 18, *Brown's-buildings, Exchange,*  
and 10, *Abercromby-square.*
- Nov. 27, 1865 Spola, Luigi, LL.D., 6a, *Hardman-street.*
- Jan. 18, 1868 Stearn, C. H., Bank of England, *Castle-street, and*  
*8, Eldon-terrace, Rock Ferry.*
- Oct. 24, 1876 Stearn, Rev. William, D.D., 8, *Hope-place.*
- Nov. 18, 1876 Stephens, Thomas English, 11, *Victoria-street.*
- Nov. 1, 1875 Stevenson, John, *Prince Alfred-road, Wavertree.*
- Jan. 9, 1865 Stewart, Robert E., L.D.S., R.C.S., Dental Sur-  
geon, Royal Southern Hospital, and Liverpool  
Dental Hospital, 87, *Rodney-street.*
- Oct. 18, 1858 Stuart, Richard, 11, *Manchester-buildings, and*  
*Brooklyn Villa, Breeze Hill, Walton.*
- \*Feb. 19, 1865 Taylor, John Stopford, M.D.Aberd., F.R.G.S.,  
2, *Millbank-terrace, Anfield-road.*
- Nov. 29, 1875 Tetley, John H., *Sunnyside, 21, Rock Park, Rock*  
*Ferry.*
- Feb. 19, 1877 Thacker, Reginald P., *Mandeville, Aigburth-road.*
- Nov. 17, 1850 Tinling, Chas., *Victoria-street, and 29, Onslow-*  
*road, Elm Park.*
- Dec. 4, 1876 Torpy, Rev. Lorenzo, M.A., *St. John's, Toxteth*  
*Park.*
- \*Feb. 19, 1844 Turnbull, James Muter, M.D.Edin., M.R.C.P.,  
Physician Royal Infirmary, 86, *Rodney-street.*
- Oct. 21, 1861 Unwin, William Andrew, 11, *Rumford-place.*
- Oct. 21, 1844 Vose, James Richard White, M.D.Edin., F.R.C.P.  
Physician Royal Infirmary, 5, *Gambier-terrace.*
- Dec. 2, 1872 Waite, Wm. Henry, D.D.S., L.D.S., 10, *Oxford-*  
*street.*
- Mar. 18, 1872 Walker, George E., F.R.C.S., 48, *Rodney-street.*
- Mar. 18, 1861 Walker, Thomas Shadford, M.R.C.S., 82, *Rodney-*  
*street.*
- Jan. 27, 1862 Walmsley, Gilbert G., 50, *Lord-street.*
- Jan. 9, 1865 Walthew, William, *Phoenix Chambers, and Vine*  
*Cottage, Aughton.*
- Feb. 19, 1877 Wallace, John, M.D., 4, *Canning-street.*

- Mar. 4, 1872 Ward, Thomas, *Brookfields House, Northwich.*
- Dec. 18, 1869 Waterhouse, Harold, 87, *Catherine-street.*
- Dec. 2, 1861 Weightman, William Henry, *Minster-buildings, Church-street, and Cambridge-road, Seaforth.*
- Oct. 80, 1876 Weightman, Arthur (Messrs. Field & Weightman), *Talbot Chambers, 8, Fenwick-street, W.*
- April 7, 1862 Whittle, Ewing, M.D., Lecturer on Medical Jurisprudence, Royal Infirmary School of Medicine, 77A, *Upper Parliament-street.*
- Jan. 11, 1875 Williams, George A., *Lombard Chambers, Bixteth-street.*
- Nov. 1, 1875 Wilson, Ed. J., 14, *Durning-road.*
- Nov. 2, 1874 Wolf, Jas. O. de (Messrs. T. C. Jones & Co.), 26, *Chapel-street.*
- Mar. 18, 1861 Wood, George S. (Messrs. Abraham & Co.), 20, *Lord-street, and Bellevue-road, Wavertree.*
- Nov. 14, 1870 Wood, John J. (Mesars. Abraham & Co.), 20, *Lord-street.*
- Nov. 29, 1875 Yates, D. E., 9, *Rumford-place, and 88, Huskisson-street.*
- Nov. 18, 1876 Yates, Edward Wilson, 87, *Castle-street.*
- Nov. 2, 1874 Young, Henry, *South Castle-street.*

## HONORARY MEMBERS.

LIMITED TO FIFTY.

- 1.—1883 The Right Hon. Dudley Ryder, Earl of Harrowby, K.G., D.C.L., F.R.S., etc., *Sandon Hall, Staffordshire, and 89, Grosvenor-square, London, W.*
- 2.—1886 The Most Noble William, Duke of Devonshire, K.G., M.A., F.R.S., D.C.L., F.G.S., etc., Chancellor of the University of Cambridge, *Chatsworth, Derbyshire, etc., and 78, Piccadilly, London, W.*
- 3.—1888 Sir George Biddell Airy, K.C.B., M.A., LL.D., D.C.L., F.R.S., F.R.A.S., etc., Astronomer Royal, *Royal Observatory, Greenwich.*
- 4.—1840 James Nasmyth, F.R.S., *Penshurst, Kent.*
- 5.—1844 T. B. Hall, Esq., *Crane House, Yarmouth.*
- 6.—1844 Peter Rylands, M.P., *Warrington.*
- 7.—1844 Thomas Rymer Jones, F.R.S., F.Z.S., F.L.S., etc., 52, *Cornwall-road, Westbourne Park, London, W.*
- 8.—1844 William B. Carpenter, M.D., F.R.S., F.L.S., Corresponding Member of the Institute of France, etc., *London.*
- 9.—1850 The Rev. Canon St. Vincent Beechy, M.A., Rector of Hilgay, *Norfolk.*
- 10.—Henry Clark Pidgeon, 47, *Sutherland-gardens, Harrow-road, London, W.*
- 11.—1851 The Rev. Robert Bickersteth Mayor, B.D., Rector of Frating, *Essex.*
- 12.—1858 The Rev. James Booth, LL.D., F.R.S., F.R.A.S., etc., *The Vicarage, Stone, near Aylesbury.*
- 13.—1857 Thomas Joseph B. Hutchinson, F.R.G.S., F.R.S.L., F.E.S., *Callao, Peru.*
- 14.—1861 The Rev. Thomas P. Kirkman, M.A., F.R.S., Rector of Croft, *near Warrington.*
- 15.—1865 The Right Rev. T. N. Staley, D.D., late Bishop of Honolulu, Vicar of Croxhall, *Staffordshire.*

- 16.—1865 Edward J. Reed, C.B., M.P., *Hull.*
- 17.—1865 George Rolleston, M.D., F.R.S., Linacre Professor of Physiology in the University of Oxford, *Oxford.*
- 18.—1865 Cuthbert Collingwood, M.A., M.B., F.L.S., etc.
- 19.—1867 J. W. Dawson, LL.D., F.R.S., etc., Principal and Vice-Chancellor of McGill University, *Montreal.*
- 20.—1868 Captain Sir James Anderson, 16, *Warrington Crescent, Maida Hill, London, W.*
- 21.—1870 Sir John Lubbock, Bart., M.P., F.R.S., etc., *High Elms, Farnborough, Kent.*
- 22.—1870 Henry E. Roscoe, F.R.S., etc., *Owens College, Manchester.*
- 23.—1870 Professor Joseph Henry, Director of the Smithsonian Institution, *Washington, U.S.*
- 24.—1870 Sir Charles Wyville Thomson, F.R.S., etc., Professor of Natural History, *Edinburgh.*
- 25.—1870 Sir Joseph Dalton Hooker, M.D., F.R.S., etc., *Royal Botanic Gardens, Kew.*
- 26.—1870 Professor Brown Séquard, M.D.
- 27.—1870 John Gwyn Jeffreys, F.R.S., 25, *Devonshire-place, Portland-place, London, W.*
- 28.—1870 Professor Thomas H. Huxley, LL.D., F.R.S., etc., 26, *Abbey-place, St. John's Wood, London.*
- 29.—1870 Professor John Tyndall, LL.D., F.R.S., etc., *Royal Institution, London.*
- 30.—1870 The Rev. Christian D. Ginsburg, LL.D., *Binfield, Bracknell, Berks.*
- 31.—1874 Professor Alexander Agassiz, Director of the Museum of Comparative Zoology, *Harvard, Cambridge, Massachusetts.*
- 32.—1874 Professor Frederick H. Max Müller, LL.D., *Oxford.*
- 33.—1874 Sir Samuel White Baker, Pasha, F.R.S., F.R.G.S., etc., *Sandford Orleigh, Newton Abbot, Devonshire.*
- 34.—1877 Professor F. V. Hayden, M.D., etc., Director of the United States Geological and Geographical Survey of the Territories, *Washington.*

## CORRESPONDING MEMBERS.

LIMITED TO THIRTY-FIVE.

- 1.—1867 Albert C. L. Günther, M.A., M.D., Ph.D., British Museum, Editor of the “Zoological Record.”
- 2.—1867 J. Yate Johnson, *London*.
- 3.—1867 R. B. N. Walker, *Gaboon, West Africa*.
- 4.—1868 Rev. J. Holding, M.A., F.R.G.S., *London*.
- 5.—1868 George Hawkins, *Colombo, Ceylon*.
- 6.—1868 J. Lewis Ingram, *Bathurst, River Gambia*.
- 7.—1869 George Mackenzie, *Cebu, Philippine Islands*.
- 8.—1870 Rev. Joshua Jones, D.C.L., King William's College, *Isle of Man*.
- 9.—1874 Samuel Archer, Surgeon-Major, *Honduras*.
- 10.—1874 Samuel Booker, *Georgetown, Demerara*.
- 11.—1874 Coote M. Chambers, *Burrard's Inlet, British Columbia*.
- 12.—1874 Edwyn C. Reed, *Museo Nacional, Santiago de Chili*.
- 13.—1874 Millen Coughtrey, M.D., *New Zealand*.
- 14.—1875 Robert Gordon, Government Engineer, *British Burmah*.

## ASSOCIATES.

LIMITED TO TWENTY-FIVE.

- 1.—Jan. 27, 1862 Captain John H. Mortimer, "America." (Atlantic.)
- 2.—Mar. 24, 1862 Captain P. C. Petrie, "City of London," Commodore of the Inman Line of American Steam Packets. (Atlantic.)
- 3.—Feb. 9, 1868 Captain James P. Anderson, R.M.S.S. "Africa," Cunard Service. (Atlantic.)
- 4.—Feb. 9, 1868 Captain John Carr (Bushby and Edwards), ship "Scindia." (Calcutta.)
- 5.—Feb. 9, 1868 Captain Charles E. Price, R.N.R. (L. Young & Co.), ship "Cornwallis." (Calcutta and Sydney.)
- 6.—April 20, 1868 Captain Fred. E. Baker, ship "Niphon." (Chinese Seas.)
- 7.—Oct. 31, 1864 Captain Thomson, ship "Admiral Lyons." (Bombay.)
- 8.—Oct. 31, 1864 Captain Alexander Browne (Papayanni), S.S. "Agia Sofia." (Mediterranean.)
- 9.—April 18, 1865 Captain Alexander Cameron (Boult, English & Brandon), ship "Staffordshire." (Shanghai.)
- 10.—Dec. 11, 1865 Captain Walker, ship "Trenton."
- 11.—Mar. 28, 1868 Captain David Scott.
- 12.—Oct. 5, 1868 Captain Cawne Warren.
- 13.—Oct. 5, 1868 Captain J. A. Perry.
- 14.—Mar. 22, 1869 Captain Robert Morgan, ship "Robin Hood."
- 15.—April 29, 1872 Captain J. B. Walker, Old Calabar.
- 16.—April 29, 1872 Captain Alfred Horsfall, S.S. "Canopus."
- 17.—Oct. 18, 1875 Captain John Slack.
- 18.—Feb. 19, 1877 Nevins, Arthur B.

## ADDITIONS TO THE LIBRARY.

Date announced.

1876.

OCTOBER 16th.

	Donors.
Diseases of the Hip, Knee, and Ankle Joints, by Hugh Owen Thomas : Liverpool, 1876 - - -	<i>The Author.</i>
On the Theory of the Flow of Water, &c., by Robert Gordon : Rangoon, 1875 - - -	<i>The Author.</i>
The Berwickshire Naturalists' Field Club :— Proceedings, vol. vii., part 8, 1875 - - -	<i>The Club.</i>
The Natural History and Antiquarian Field Club, Bath :— Proceedings, vol. iii., part 8, 1876 - - -	<i>The Club.</i>
The Naturalists' Society, Bristol :— Proceedings, vol. i., part 8, 1876 - - -	<i>The Society.</i>
The Naturalists' Field Club, Belfast :— Proceedings, vol. i., parts ii. and iii., 1875-6	<i>The Club.</i>
The American Academy of Arts and Sciences, Boston :— Proceedings, vol. iii., 1875-6 - - -	<i>The Academy.</i>
The Society of Natural History, Boston :— Memoirs, 4to., vol. ii., part iv., nos. 2, 3, 4, 1875 - - -	
Occasional Papers, no. ii., 1876 - - -	
Proceedings, vol. xvii., parts 8 and 4, 1875 ; vol. xviii., parts 1 and 2, 1876 - - -	<i>The Society.</i>
L'Académie Royale des Sciences, des Lettres, et des Beaux-Arts, de Belgique, Brussels :— Bulletin, tomes xxxvii.-xl., 1874-5 - - -	
Centième Anniversaire, tomes i.-ii., 1875 - - -	
Annuaire, 1875-6 - - -	<i>The Academy.</i>

- The Society of Natural Sciences, Buffalo :—  
 Bulletin, vol. iii., part 2, 1876 - - - - - *The Society.*
- The Natural History Society, Chester :—  
 Report, 1875 - - - - - *The Society.*
- The Geological Survey of India, Calcutta :—  
 Memoirs, vol. xi., part 2, 1875 - - - - -  
 Records, vol. viii., 1875, and vol. ix., part 1,  
 1876 - - - - - } *The Governor  
General in  
Council.*  
 Palæontologia Indica, 4to., series ix., parts 2,  
 8, 4, 1875 - - - - - }
- La Société Imperiale des Sciences Naturelles de Cherbourg :—  
 Mémoires, tome xix., 1875 - - - - - *The Society.*
- The Philosophical Society, Glasgow :—  
 Proceedings, vol. x., part 1, 1876 - - - - - *The Society.*
- The Royal Asiatic Society, London :—  
 Journal, vol. viii., part 2, 1876 - - - - - *The Society.*
- The Society of Antiquaries, London :—  
 Proceedings, vol. vi., parts 5 and 6, 1875-6 *The Society.*
- The Anthropological Institute, London :—  
 Journal, nos. 15 and 16, 1876 - - - - - *The Institute.*
- The Royal Astronomical Society, London :—  
 Monthly Notices, vol. xxxvi., parts 5 and 6,  
 1876 - - - - - *The Society.*
- The Royal Geographical Society, London :—  
 Proceedings, vol. xx., parts 3 to 6, 1876 - - -  
 Journal, vol. xl., 1875 - - - - - *The Society.*
- The Geological Society, London :—  
 Journal, vol. xxxii., parts 2 and 3, 1876 - - - *The Society.*
- The Geologists' Association, London :—  
 Proceedings, vol. iv., part 7, 1876 - - - - - *The Association.*
- The Linnæan Society, London :—  
 Journal (Botany), nos. 88 to 85, 1876 ;  
 (Zoology), nos. 68 to 65, 1876 - - - - - *The Society.*
- The Society of Arts :—  
 Journal, London, to this date - - - - - *The Society.*

"Nature," "Science-Gossip," and the Quarterly Journal of Science, to this date - - - *The Editors.*

OCTOBER 23rd.

The Literary and Scientific Society, Birkenhead :—

Report, 1875-6 - - - - - *The Society.*

The Chemical Society, London :—

Journal, March-Sept., 1876 - - - - - *The Society.*

The British Meteorological Society, London :—

Journal, no. 18, 1876 - - - - - *The Society.*

The Institution of Civil Engineers, London :—

Proceedings, vols. xliii. to xlv., 1876 - - - - - *The Institution.*

The Royal Society, London :—

Proceedings, nos. 168 to 172, 1876 - - - - - *The Society.*

The Statistical Society, London :—

Journal, vol. xxxix., parts 1 and 2, 1876 - - - - - *The Society.*

The East Indian Association, London :—

Journal, vol. ix., parts 4 and 5, 1876 - - - - - *The Association.*

The Zoological Society, London :—

Proceedings, in 1 vol., 1875 - - - - - *The Society.*

The Geological Society of the West Riding, Leeds :

Proceedings, no. 2, 1875 - - - - - *The Society.*

The Literary and Philosophical Society, Leicester :—

Report, 1875 - - - - - *The Society.*

The Town Museum, Leicester :—

Report, 1875 - - - - - *The Trustees.*

The Naturalists' Field Club, Liverpool :—

Report, 1875 - - - - - *The Club.*

The Athenaeum Library, Liverpool :—

Supplementary Catalogue, 1875 - - - - - *The Committee.*

The Powys-Land Club :—

Catalogue and Collections, 1875 - - - - - *The Club.*

The Literary Club, Manchester :—

Papers, vol. ii., 1878

Glossary of the Lancashire Dialect, by J. H.

Nodal and G. Milner, part 1, 1875

- - - - - *The Club.*

## Reale Instituto Lombardo, Milan:—

Memoires : i. Classe de Scienze, Matematiche, e Naturali ; vol. xiii., Fasciolo 2, 1875 ; ii. Classe di Lettere e Scienze Morali e Politiche ; vol. xiii., Fasciolo 2, 1875 ; iii. Rendiconti ; vol. vii., Fasc. 17 to 20, 1874 ; vol. viii., Fasc. 1 to 20, 1875 - *The Institute.*

## The Connecticut Academy of Arts and Sciences,

## New Haven :—

Transactions, vol. iii., part 1, 1876 - - - *The Academy.*

## The Union Society, Oxford :—

Speeches, Catalogue, &c., 1875 - - - - *The Society.*

## The Academy of Natural Sciences, Philadelphia :—

Proceedings, vol. for 1875 - - - - *The Academy.*

## The Franklin Institute, Philadelphia :—

Journal, vol. lxxi., 1876 - - - - *The Institute.*

## The American Association for the Advancement

## of Science, Salem :—

Memoirs, 4to, vol. i., part 1, 1876 - - - *The Association.*

## L'Académie Royale Suédoise des Sciences, Stockholm :—

Handlingar (Mémoires), 4to., vol. xi., 1875 ;  
Bihang (Supplément aux Mémoires), vol.  
iii., part 1, 1876 ; Ofversigt (Bulletin), vol.  
for 1875 - - - - - *The Academy.*

## The Canadian Institute, Toronto :—

Journal, vol. xv., parts 1 and 2, 1876 - - - *The Institute.*

## Der Geographischen Gesellschaft, Wien :—

Mittheilungen, 1874-5 - - - - - *The Society.*

"Nature," to date - - - - - *The Editor.*

## NOVEMBER 4th.

Chemical and Physical Researches : by Thomas Graham, F.R.S., &c., Edinburgh (for presentation only) - - - - - *James Young,  
F.R.S., & Dr.  
Angus Smith,  
F.R.S.*

- Liverpool Winds: Two Papers by W. W. Rundell, F.M.S. - - - - - *The Author.*
- Reports on the Physical, Descriptive, and Economic Geology of British Guiana: by C. B. Brown, F.G.S., and J. G. Sawkins, F.G.S. 1875 - - - - - *Samuel Booker, Esq.*
- The Ashmolean Society, Oxford :—  
On a new form of Polariscopic, by R. H. M. Bosanquet, M.A., &c. - - - - - *The Society.*
- The Yorkshire Philosophical Society, York :—  
Annual Report, 1875 - - - - - *The Society.*
- The U. S. Geological and Geographical Survey of the Territories, Washington :—  
Bulletin, vol. ii., parts 2-4, 1876 - - - - -  
Annual Report (New Mexico, &c.), 1874 *Dr. F. V. Hayden.*
- The Naval Observatory, Washington :—  
Astronomical and Meteorological Observations (4to.), 1878 - - - - - *Rear-Admiral Davis.*
- The Canadian Institute, Toronto :—  
Journal, vol. xv., part 8, 1876 - - - - - *The Institute.*
- The Somerset Archaeological Society, Taunton :—  
Proceedings, N.S., vol. i., 1876 - - - - - *The Society.*
- The Royal Institution of Cornwall, Truro :—  
Journal, vol. xviii., 1876 - - - - - *The Institution.*
- The Essex Institute, Salem, Mass. :—  
Bulletin, vol. vii., 1875 - - - - - *The Institute.*
- The Franklin Institute, Philadelphia :—  
Journal, vol. lxxii., parts 1-4, 1876 - - - - - *The Institute.*
- The Philosophical and Literary Society, Leeds :—  
Transactions, 1875-6 - - - - - *The Society.*
- The Zoological Society, London :—  
Proceedings, 1876, parts 1-8 - - - - - *The Society.*
- The East Indian Association, London :—  
Journal, vol. x., part 1, 1876 - - - - - *The Association.*
- The Statistical Society, London :—  
Journal, vol. xxxix., part 8, 1876 - - - - - *The Society.*

## The British Meteorological Society, London :—

Journal, no. 19, 1876 - - - - - *The Society.*

## The Linnean Society, London :—

Journal (Botany), no. 86, 1876 - - - - - *The Society.*

## The Geologists' Association, London :—

Proceedings, vol. iv., part 8, 1876 - - - - - *The Association.*

## The Chemical Society, London :—

Journal, October, 1876 - - - - - *The Society.*

## The Anthropological Institute, London :—

Journal, no. 17, 1876 - - - - - *The Institute.*

## Der Königlichen Physikalisch-ökonomischen Gesellschaft, zu Königsberg :—

Schriften, Sechszehnter Jahrgang, 1875 - - - - - *The Society.*

## The Literary and Philosophical Society, Hull :—

Proceedings, 1875-6 - - - - - *The Society.*

## The Royal Asiatic Society, Bombay :—

Journal, nos. 82-88, 1873 - - - - - *The Society.*

## The Society of Arts, London :—

Journal, to date - - - - - *The Society.*

"Nature," London, Oct. 17th and 24th - - - - - *The Editor.*

## DECEMBER 4th.

On Thrombosis and Embolism, by James Turnbull, M.D.: London, 1876 - - - - - *The Author.*

Two Papers on the Glacial Period, by James Croll, LL.D., F.R.S.: Edinburgh, 1876 - - - - - *The Author.*

The Museum of Comparative Zoology, Cambridge, Mass. :—

Memoirs (4to.), vol. ii., part 9 - - - - -

On some Insect Deformities, by A. H. Hagen, 1876 - - - - -

Bulletin, vol. iii., parts 11-16, 1876 - - - - - *The Trustees.*

The Peabody Museum of American Archaeology, Cambridge, Mass. :—

Report, 1868-74 - - - - - *The Trustees.*

- The Royal Scottish Society of Arts, Edinburgh :—  
 Report, 1875–6 - - - - - *The Society.*
- The Royal Cornwall Polytechnic Society, Falmouth :—  
 Report, vol. xliii., 1875 - - - - - *The Society.*
- The Royal Astronomical Society, London :—  
 Monthly Notices, vol. xxxvi., parts 6–9, 1876 *The Society.*
- The Institution of Civil Engineers, London :—  
 Proceedings, vol. xlvi., 1876 - - - - - *The Institution.*
- The Chemists' Association, Liverpool :—  
 Report, 1875–6 - - - - - *The Association.*
- The Literary and Philosophical Society, Manchester :—  
 Memoirs (3rd series), vol. v., 1876 - - - - -  
 Proceedings, vol. xv., 1875–6, and Catalogue  
     of Library - - - - - *The Society.*
- The Plymouth Institute, Plymouth :—  
 Transactions, 1875–6 - - - - - *The Institute.*
- The Franklin Institute, Philadelphia :—  
 Journal, vol. lxxii., part 5, 1876 - - - - - *The Institute.*
- The United States Geological and Geographical  
 Survey, Washington :—  
 Memoirs (4to.), vol. ix. - - - - -  
 On Invertebrate Cretaceous Fossils, by F. B.  
     Meek, 1876 - - - - -  
 Memoirs, vol. x. - - - - -  
 A Monograph of the Geometrid Moths, or Pha-  
     lanidæ, by A. S. Packard, Jun., 1876 *Dr. F. V. Hayden.*

---

1877.

JANUARY 1st.

- The Massachusetts Board of Agriculture :—  
 Annual Report, Boston, 1876 - - - - - *The Board.*
- The Museum of Comparative Zoology, Cambridge,  
 Mass. :—  
 Memoirs (4to.), vol. iv., part 10 - - - - -  
 On the American Bisons, by J. A. Allen, 1876 *The Trustees.*

**The Society of Antiquaries :—**

Proceedings, vol. vii., part 1, London, 1876 *The Society.*

**The Chemical Society :—**

Journal, London, November and December,

1876 - - - - - *The Society.*

**The Geological Society :—**

Journal, vol. xxxii., part 4, London, 1876 *The Society.*

**The Royal Society :—**

Proceedings, nos. 178-4, London, 1876 - *The Society.*

**The Royal Medico-Chirurgical Society :—**

Transactions, vol. lix., London, 1876 - *The Society.*

**The American Philosophical Society :—**

Proceedings, nos. 96, 97, Philadelphia, 1876 *The Society.*

**The Natural History Society and Field Club :—**

Transactions, vol. i., parts 4 and 5, Watford,

1876 - - - - - *The Society.*

"Science-Gossip," "Nature," - - - - - *The Editors.*

**The Society of Arts :—**

Journal, London, to this date - - - - - *The Society.*

---

**JANUARY 15th.****La Société des Sciences Physiques et Naturelles :—**

Mémoires, 2e Série, 8e Cahier, Bordeaux, 1876 *The Society.*

**The Botanical Society :—**

Proceedings, vol. xii., part 3, Edinburgh, 1876 *The Society.*

**The Meteorological Society of Scotland :—**

Journal, nos. 49, 50, Edinburgh, 1876 - *The Society.*

**The Royal Astronomical Society :—**

Monthly Notices, vol. xxxvii., part 1.,

1876 - - - - - *The Society.*

**The Geologists' Association :—**

Proceedings, vol. iv., part 9, London, 1876 *The Association.*

**The Linnæan Society :—**

Proceedings (Botany), no. 87 - - - - -

Proceedings (Zoology), no. 66, London, 1876 *The Society.*

- The Numismatic Society :—  
 Journal, 8vo. and 4to., vol. ii., part 1, Liverpool, 1876 - - - - - *The Society*
- The Powys-land Club :—  
 Collections, vols. vi.—ix., Liverpool, 1873—6 *The Club.*
- The Royal Geological Society of Cornwall :—  
 Report, no. 62, Penzance, 1876 - - - - - *The Society.*
- The Franklin Institute :—  
 Journal, vol. lxxii., part 6, Philadelphia, 1876 *The Institute.*
- “Nature,” London, Jan. 4th and 11th, 1877 - - - - - *The Editor.*
- 

## JANUARY 29th.

- Ueber das Auftreten der Wanderheuschrecke am Vfer des Bierlersee's, von Albert Müller in Basel, 1876 - - - - - *The Author.*
- Mineral Map and General Statistics of New South Wales, by A. Liversidge, Sydney, 1876 - - - - - *The Author.*
- Les Bateaux Hémi Plongeurs, par Donato Tommasi, Docteur des Sciences, &c.: Paris, 1876 - - - - - *The Author.*
- Progress: Notes on Systems of Education, by S. Leigh-Gregson, Liverpool, 1876 - - - - - *The Author.*
- Dun Echt Observatory Publications, vol. i., 4to.;—  
 A Summary or Index of the Measurements in the “Stellarum Duplicium et Multiplicium Mensuræ Micrometricæ,” Struve, 1887; “Additamentum in F. G. W. Struve Mensuras Micrometricas Stellarum Duplicium,” 1887—40, &c., arranged in order of R.A., and the positions brought up to 1875, Aberdeen, 1876 - - - - - *Lord Lindsay, F.R.A.S.*
- The Royal Astronomical Society :—  
 Monthly Notices, vol. xxxvii., no. 2, London, 1876 - - - - - *The Society.*
- The Chemical Society :—  
 Journal, Jan., 1877: London - - - - - *The Society.*

## The Royal Microscopical Society :—

Journal, vols. xv.—xvi., London, 1876 - *The Society.*  
The Literary and Philosophical Society, Leices-

ter :—

Address by the Rev. A. Mackennal, B.A.,  
President, on Education and Culture, 1876 *The Society.*  
The Canadian Institute :—  
Journal, vol. xv., part 4, Toronto, Jan. 1877 *The Institute.*  
"Nature," London, Jan. 11th and 18th, 1877 - *The Editor.*  
The Society of Arts :—  
Journal, London, Jan. 12th and 19th, 1877 *The Society.*

---

## FEBRUARY 12th.

La Première Campagne de la Crimée, ou les  
Batailles mémorables de l'Alma, de Balaclava,  
et d'Inkerman, par Austin Layard, Traduit  
par Miss A. E. S. Jervis, Bruxelles, 1855 -  
*Mrs. A. E. S. Guerritore (née Jervis).*

The Local Committee of the British Association,  
Glasgow :—

1. On the Industries of Glasgow and of the  
Clyde Valley. 2. On the Western Scottish  
Fossils. 3. The Fauna and Flora of  
Western Scotland - - - - *The Committee.*

Smithsonian Institution, Washington :—

Smithsonian Contributions to Knowledge,  
4to., vol. xx. On the Winds of the Globe,  
by James Henry Coffin, LL.D.; com-  
pleted after the Author's decease, by Selden  
Jennings Coffin, M.A., with a Discussion  
and Analysis of the Tablets and Charts, by  
Dr. Alexander Woeikof, Washington, 1875.  
Vol. xxi., containing : 1. Statement and  
Exposition of certain Harmonies of the  
Solar System, by Stephen Alexander, LL.D.

2. On the General Integrals of Planetary Motion, by Simon Newcomb. 8. The Haidah Indians of Queen Charlotte Islands, British Columbia, by James G. Swan.  
4. Tables, Distribution, and Variations of Atmospheric Temperature in the United States, and some adjacent parts of North America, collected by the Smithsonian Institution, and discussed under the direction of Professor Joseph Henry, Secretary, by C. A. Schott, Washington, 1876 - *The Institution.*

The Franklin Institute :—

Journal, vol. lxxiii., part 1, Philadelphia,  
1877 - - - - - *The Institute.*

The Free Public Library, Museum, and Gallery of Art :—

Twenty-fourth Annual Report, Liverpool,  
1876-7 - - - - - *The Committee.*

The Statistical Society :—

Journal, vol. xxxix., part 4, London, 1876 - *The Society.*

The Royal Institution :—

Proceedings, vol. viii., parts 1-2, London,  
1876 - - - - - *The Institution.*

The British Meteorological Society :—

Journal, no. 20, London, 1876 - - - - - *The Society.*

The Royal Geographical Society :—

Proceedings, vol. xxi., part 1, London,  
1877 - - - - - *The Society.*

The Royal Astronomical Society :—

Monthly Notices, London, Jan. 7, 1877 - *The Society.*

The Anthropological Institute :—

Journal, no. 18, London, 1877 - - - - - *The Institute.*

The Royal Asiatic Society :—

Journal, vol. ix., part 1, London, 1876 - *The Society.*

The Royal Society :—

Proceedings, 1875-6, Edinburgh, 1877 - *The Society.*

## The Society of Arts :—

- Journal, Jan. 26th and Feb. 2nd and 9th,  
 London, 1877 - - - - - *The Society.*  
 "Nature," London, Feb. 1st and 8th, 1877 ;  
 "Science-Gossip," London, Feb., 1877 ;  
 "Quarterly Journal of Science," London,  
 Jan., 1877 - - - - - *The Editors.*
- 

## FEBRUARY 26th.

## The Harvard University :—

- Annual Report, 1875-6, Cambridge, Mass.,  
 1876 - - - - - *The Senate.*

## Det Kongelige Norske Universitet :—

1. Quellen zur Geschichte des Taufsymbols  
 und der Glaubensregel, von C. P. Caspari,  
 bandet iii., Christiania, 1875. 2. Transfu-  
 sion und Plethora, von Jacob W. Müller,  
 Christiania, 1876 - - - - - *The Senate.*

## The Royal Society :—

- Proceedings, nos. 175-6, London, 1877 - - - *The Society.*

## The Literary Club :—

- Transactions, vol. i., Manchester, 1875 - - - *The Club.*

## The Lyceum of Natural History, New York :—

- Annals, vol. x., parts 12-14, 1874 ; vol. xi.,  
 parts 1-8, 1875 ; Proceedings, 1878-5 - - *The Lyceum.*

## The American Association for the Advancement of

## Science :—

- Proceedings, vol. xxiv., Salem, Mass., 1875 *The Association.*

## The Smithsonian Institution :—

- Report, 2 vols., Washington, 1854-5 - - *The Institution.*

- "Nature," London, Feb. 16th and 23rd, 1877 - - *The Editor.*

## The Society of Arts :—

- Journal, Feb. 17th and 24th, London,  
 1877 - - - - - *The Society.*
-

MARCH 12th.

The Strassburg University :—

De Solœcismo, Commentatio Philologica quam  
scripsit, G. Schepss, Argentatori, 1875.  
Quos Auctores in ultimis Belli Peloponnesi-  
aci annis describendis secuit sint Diodorus  
Plutarchus Cornelius Justinus, scripsit,  
Paulus Natorp, Argentorati, 1876. Etude  
sur le Vocalisme des Patois Romans du  
Canton de Fribourg, par François Haefelin,  
Leipsig, 1876. Theopompea, Carolus  
Buenger, Argentorati, 1874. Die Ver-  
schiebung Lateinischer Tempora in den  
Romanischen Sprachen, von Karl Foth,  
Strassburg, 1876. Jacob Sturm von Stur-  
meck, Strassburgs grosser Stettmeister  
und Scholarch, von Professor D. Baum,  
Strassburg, 1874. Die Neugründung der  
Strassburger Bibliothek, Strassburg, 1871.  
Die Einweihung der Strassburger Univer-  
sität, Officeller Festbericht, Strassburg,  
1872. Zur Geschichte der Universitat  
Strassburg, von Dr. August Schricker.  
Strassburgh, 1872. Der Rectoratswechsel  
an der Universität Strassburg, 1874. Die  
Kaiserliche Universitäts- und Landesbiblio-  
thek in Strassburg, ein Vortrag von C. G.  
Hottinger, Strassburg, 1875 - - - - *The Senate.*

The Franklin Institute :—

Journal, vol. lxxviii., part 2, Philadelphia, 1877 *The Institute.*

The British Meteorological Society :—

Journal, no. 21, London, 1877 - - - - *The Society.*

The Literary and Philosophical Society :—

Report, 1876, Whitby - - - - *The Society.*

The Geological Society :—

Journal, vol. xxxiii., part 1, London, 1877 - *The Society.*

## The Geologists' Association :—

Report, 1876, London, 1877 . . . . . *The Association.*

## The Chemical Society :—

Journal, London, February, 1877 . . . . . *The Society.*

## The Institution of Civil Engineers :—

Proceedings, vol. xlvii., London, 1877 . . . . . *The Institution.*

## The Society of Arts :—

Journal, London, February 28th and March

2nd, 1877 . . . . . *The Society.*

"Nature," London, Feb. 22nd and March 1st,

1877 . . . . . *The Editor.*

## MARCH 31st.

" Greenwich Observations " during 1874, London,

1877 . . . . . *The Government.*

## The Royal Astronomical Society :—

Monthly Notices, vol. xxxvii., part 4, London,

1877 . . . . . *The Society.*

## The Chemical Society :—

Journal, London, 1877 . . . . . *The Society.*

## The Royal Geographical Society :—

Proceedings, vol. xxi., part 2, London, 1877 *The Society.*

## The Society of Arts :—

Journal, London, March, 1877 . . . . . *The Society.*" Nature," London, March 15th and 22nd, 1877 *The Editor.*

## APRIL 9th.

La Société Nationale des Sciences Naturelles de  
Cherbourg :—Compte-Rendu de la Séance Extraordinaire  
tenue par la Société le 80 Décembre, 1876,  
a l' occasion du vingt-cinquième anniver-  
saire de sa fondation, Cherbourg, 1877 . . . . . *The Society.*

## The Royal Scottish Society of Arts :—

Transactions, vol. ix., part 4, Edinburgh, 1877 *The Society.*

- The Royal Geographical Society :—  
 Proceedings, vol. xxi., part 8, London,  
 1877 - - - - - *The Society.*
- The Linnaean Society :—  
 Journal (Botany), no. 88 ; Journal (Zoology),  
 no. 67 ; London, 1877 - - - - - *The Society.*
- The Royal Society :—  
 Proceedings, nos. 177-178, London, 1877 - *The Society.*
- The Historic Society of Lancashire and Cheshire :—  
 Transactions, 8rd series, vols. iii.-iv., Liver-  
 pool, 1874-6 - - - - - *The Society.*
- The Powys-land Club :—  
 Collections, vol. x., part 1, Liverpool, 1877 *The Club.*
- The Natural History Society of Northumberland  
 and Durham :—  
 Transactions, vol. v., part 8, Newcastle-on-  
 Tyne, 1876 - - - - - *The Society.*
- The Astor Library, New York :—  
 Report, 1876 - - - - - *The Trustees.*
- The American Geographical Society :—  
 Bulletin, no. 2, New York, 1877 - - - - - *The Society.*
- The Franklin Institute :—  
 Journal, vol. lxxiii., part 8, Philadelphia,  
 1877 - - - - - *The Institute.*
- “The Quarterly Journal of Science,” London,  
 April, 1877, and “Nature,” London, to date *The Editors.*

## APRIL 28rd.

- Narrative of the Discovery of the Great Central  
 Lakes of Africa, by J. L. Clifford Smith,  
 F.R.G.S., Halifax, 1877 - - - - - *The Author.*
- Description of some new Sponges, obtained during  
 a Cruise of the steam yacht “Argo” in the  
 Caribbean and neighbouring Seas, by T. Higgin,  
 F.L.S., 1877 - - - - - *The Author.*

On the Origin and Vicissitudes of Literature,  
Science, and Art, and their Influence on the  
Present State of Society ; a Discourse delivered  
on the Opening of the Royal Institution, by  
William Roscoe, Liverpool, 1817 - - - *A. Higginson, Esq.*

The Royal Astronomical Society :—

Monthly Notices, vol. xxxvii., part 5, London,  
1877 - - - - - *The Society.*

The East Indian Association :—

Journal, vol. x., part 2, London, 1877 *The Association.*

“The Quarterly Journal of Science,” London, April,  
1877 ; “Science-Gossip,” London, April, 1877 ;  
and “Nature,” London, April 6th, 18th, and  
20th, 1877 - - - - - *The Editors.*

The Society of Arts :—

Journal for April, London, 1877 - - - *The Society.*

The Franklin Institute :—

Journal, vol. lxxiii., parts 8-4, Philadelphia,  
1877 - - - - - *The Institute.*

The Royal Institution of Cornwall :—

Report, Truro, 1877 - - - - - *The Institution.*

**LIST OF SOCIETIES, ACADEMIES, INSTITUTIONS, ETC.**

**TO WHICH THIS VOLUME IS PRESENTED.**

---

(*The Asterisk denotes those from which Donations have been received this Session.*)

---

- Aberdeen . . . . \*The Dun-Echt Observatory.*
- Alnwick . . . . \*The Berwickshire Naturalists' Field Club.*
- Bath . . . . \*The Natural History and Antiquarian Field Club.*
- Belfast . . . . \*The Naturalists' Field Club.*
- Belfast . . . . \*The Natural History and Philosophical Society.*
- Bristol . . . . \*The Naturalists' Society.*
- Birkenhead . . . . The Free Public Library.*
- Birkenhead . . . . \*The Literary and Scientific Society.*
- Bordeaux . . . . \*La Société des Sciences Physiques et Naturelles.*
- Bombay . . . . \*The Royal Asiatic Society.*
- Boston (Mass.) . . \*The American Academy of Arts and Sciences.*
- Boston (Mass.) . . \*The Natural History Society.*
- Boston (Mass.) . . \*The Massachusetts Boards of Agriculture, Education, State Charities, and Health.*
- Boston (Mass.) . . The Free Public Library.*
- Buffalo (N.Y.) . . \*The Society of Natural Sciences.*
- Burlington (Vt.) . . \*The Orleans County Society of Natural Sciences.*
- Brussels . . . . \*L'Académie Royale des Sciences, des Lettres, et des Beaux-Arts de Belgique.*
- Chester . . . . \*The Natural History Society.*
- Chester . . . . The Architectural and Archæological Society.*
- Cambridge . . . . The Philosophical Society.*
- Cambridge (Mass.) \*The Harvard University.*

- Cambridge (Mass.)* \*The Museum of Comparative Zoology.  
*Cambridge (Mass.)* \*The Peabody Museum of American Archaeology.  
*Canterbury* . . . . The Union Society.  
*Calcutta* . . . . \*The Asiatic Society of Bengal.  
*Calcutta* . . . . \*The Geological Survey of India.  
*Cherbourg* . . . . \*La Société Imperiale des Sciences Naturelles.  
*Chicago* . . . . The Public Library.  
*Christiana* . . . . \*The University.  
*Copenhagen* . . . . L'Académie Royale.  
*Copenhagen* . . . . La Société Royale des Antiquaires du Nord.  
*Davenport (Iowa)* . \*The Academy of Natural Sciences.  
*Dublin* . . . . \*The Royal Irish Academy.  
*Dublin* . . . . \*The Royal Geological Society of Ireland.  
*Dublin* . . . . The Royal Society.  
*Edinburgh* . . . . \*The Royal Scottish Society of Arts.  
*Edinburgh* . . . . \*The Botanical Society.  
*Edinburgh* . . . . \*The Meteorological Society of Scotland.  
*Edinburgh* . . . . \*The Royal Physical Society.  
*Edinburgh* . . . . \*The Royal Society.  
*Edinburgh* . . . . The Philosophical Institution.  
*Edinburgh* . . . . \*The Geological Society.  
*Falmouth* . . . . \*The Royal Cornwall Polytechnic Society.  
*Glasgow* . . . . \*The Philosophical Society.  
*Glasgow* . . . . \*The Geological Society.  
*Greenwich* . . . . \*The Royal Observatory.  
*Gireswald* . . . . The University.  
*Hull* . . . . \*The Literary and Philosophical Society.  
*Halifax* . . . . \*The Literary and Philosophical Society.  
*Königsberg* . . . . \*Der Königlichen Physikalisch-ökonomischen  
                           Gesellschaft.  
*London* . . . . \*The Society of Arts.  
*London* . . . . \*The Royal Asiatic Society.  
*London* . . . . \*The Society of Antiquaries.  
*London* . . . . \*The Anthropological Institute.  
*London* . . . . \*The Royal Astronomical Society.

- London . . . . .* The British Association.  
*London . . . . .* The British Museum.  
*London . . . . .*\*The Chemical Society.  
*London . . . . .* The Clinical Society.  
*London . . . . .*\*The Royal Geographical Society.  
*London . . . . .*\*The Geological Society.  
*London . . . . .*\*The Geologists' Association.  
*London . . . . .*\*The Linnaean Society.  
*London . . . . .*\*The British Meteorological Society.  
*London . . . . .*\*The Royal Society of Literature.  
*London . . . . .*\*The Royal Society.  
*London . . . . .*\*The Royal Institution.  
*London . . . . .*\*The Statistical Society.  
*London . . . . .*\*The Medico-Chirurgical Society.  
*London . . . . .*\*The Institution of Civil Engineers.  
*London . . . . .*\*The Royal Institute of British Architects.  
*London . . . . .*\*The Royal Microscopical Society.  
*London . . . . .*\*The East Indian Association.  
*London . . . . .*\*The Zoological Society.  
*London . . . . .*\*The Editor of "Nature."  
*London . . . . .*\*The Editor of "Quarterly Journal of Science."  
*London . . . . .*\*The Editor of "Science Gossip."  
*London . . . . .*The Editor of "Geological Magazine."  
*Leeds . . . . .*\*The Philosophical and Literary Society.  
*Leeds . . . . .*\*The Geological Society of West Riding of Yorkshire.  
*Liverpool . . . . .*\*The Architectural Society.  
*Liverpool . . . . .*\*The Historic Society.  
*Liverpool . . . . .*\*The Geological Society.  
*Liverpool . . . . .*\*The Philomathic Society.  
*Liverpool . . . . .*The Polytechnic Society.  
*Liverpool . . . . .*\*The Naturalists' Field Club.  
*Liverpool . . . . .*The Microscopical Society.  
*Liverpool . . . . .*The Chemists' Association.  
*Liverpool . . . . .*\*The Numismatic Society.  
*Liverpool . . . . .*The Royal Institution.

<i>Liverpool</i>	. . .	*The Free Public Library.
<i>Liverpool</i>	. . .	The Medical Institution.
<i>Liverpool</i>	. . .	The Lyceum News Room.
<i>Liverpool</i>	. . .	The Athenaeum Library and News Room.
<i>Liverpool</i>	. . .	The Liverpool Library.
<i>Liverpool</i>	. . .	*The Powys-land Club.
<i>Leicester</i>	. . .	*The Literary and Philosophical Society.
<i>Manchester</i>	.	*The Literary and Philosophical Society.
<i>Manchester</i>	. . .	The Free Public Library.
<i>Manchester</i>	. . .	The Chetham Library.
<i>Manchester</i>	. . .	*The Owens College.
<i>Manchester</i>	. . .	*The Literary Club.
<i>Melbourne</i>	. . .	*The Royal Society of Victoria.
<i>Milan</i>	. . .	*La Reale Instituto Lombardo.
<i>Newcastle-on-Tyne</i>	. . .	*Natural History Society.
<i>New York</i>	. . .	*The Astor Library.
<i>New York</i>	. . .	*The American Geographical Society.
<i>New York</i>	. . .	*The Academy of Sciences.
<i>New York</i>	. . .	The City University.
<i>New York</i>	. . .	The State University.
<i>New York</i>	. . .	*The State Library.
<i>New York</i>	. . .	*The State Museum of Natural History.
<i>New Haven</i>	. . .	*The Connecticut Academy of Arts and Sciences.
<i>Oxford</i>	. . .	*The Ashmolean Society.
<i>Oxford</i>	. . .	*The Union Society.
<i>Otago</i>	. . .	The University.
<i>Ottawa</i>	. . .	The Library of Parliament.
<i>Plymouth</i>	. . .	*The Plymouth Institute.
<i>Penzance</i>	. . .	*The Royal Geological Society of Cornwall.
<i>Philadelphia</i>	. . .	*The American Philosophical Society.
<i>Philadelphia</i>	. . .	*The Academy of Natural Sciences.
<i>Philadelphia</i>	. . .	*The Franklin Institute.
<i>Philadelphia</i>	. . .	*The Zoological Society.
<i>Philadelphia</i>	. . .	*The Pennsylvania Board of Public Education.
<i>Salem (Mass.)</i>	. . .	*The Essex Institute.

- Salem (Mass.)* . . \*The American Association for the Advancement of Science.
- Stockholm* . . . \*L'Académie Royale Suedoise des Sciences.
- Southport* . . . The Literary and Philosophical Society.
- Strasburg* . . . \*La Bibliothèque Municipale.
- Strasburg* . . . \*Die Kaiserliche Universitäts-und Landes-bibliothek.
- Truro* . . . \*The Royal Institution of Cornwall.
- Taunton* . . . \*The Somersetshire Archaeological Society.
- Toronto* . . . \*The Canadian Institute.
- Vienna* . . . \*Der Geographischen Gesellschaft.
- Whitby* . . . \*The Literary and Philosophical Society.
- Washington* . . . \*The Naval Observatory.
- Washington* . . . The Department of Patents.
- Washington* . . . \*The Department of Agriculture.
- Washington* . . . \*The Smithsonian Institution.
- Washington* . . . \*The War Office.
- Washington* . . . \*The Geological and Geographical Survey of the Territories.
- York* . . . \*The Philosophical Society.

**TREASURER'S ACCOUNT, 1875-6.**

¶r.      *The LITERARY AND PHILOSOPHICAL SOCIETY, in Account with R. C. JOHNSON, Treasurer.*

¶s.

	£ s. d.	£ s. d.
1875-6.		1874-5.
To Balance brought forward.....	62 4 3	By Balance brought forward:—
To Cash paid D. Marples & Co., Limited (Printing) .....	147 11 6	Dock Bond .....
" " G. G. Walmsley (Printing) .....	5 9 0	By Cash paid for Subscriptions:—
" " Tinting & Co., ditto .....	10 1 6	179 Annual, at 21s. ....
" " Printing & Stationery Co. .....	0 10 9	1 Half do. at 10s. 6d. ....
" " G. S. Wood .....	0 5 6	24 Entrance, at 10s. 6d. ....
" " Mr. Johnson (Fee) .....	26 16 0	18 Arrears, at 21s. ....
" " S. Burke (Attendance) .....	1 17 6	
" " Secretary (Expenses) .....	16 1 6	By Cash, Interest on Dock Bonds .....
" " " (Editorial Fee) .....	10 10 0	By Balance.....
" " Librarian for Carriage of Parcels .....	8 7 1	
" " Treasurer for Sundries .....	0 10 6	
To Balance in hand (Dock Bond).....	250 0 0	
	<hr/> <hr/>	<hr/> <hr/>
To Balance .....	54 9 8	54 9 8
	<hr/> <hr/>	<hr/> <hr/>
	2535 7 1	2535 7 1

Examined and found correct,

C. H. STEARN,  
EDWARD DAVIES.



PROCEEDINGS  
OF THE  
LIVERPOOL  
LITERARY AND PHILOSOPHICAL SOCIETY.

---

ANNUAL MEETING.—SIXTY-SIXTH SESSION.

ROYAL INSTITUTION, October 2nd, 1876.

JAMES ALLANSON PICTON, F.S.A., PRESIDENT,  
in the Chair.

The Minutes of the last Meeting of the previous Session were read and confirmed, and the Honorary Secretary then read the following

REPORT.

"The affairs of the Literary and Philosophical Society of Liverpool continue to be in a satisfactory condition; the Ordinary Meetings are numerously attended, and the roll of members, though slightly decreased, is still considerable. At the commencement of the Session the Ordinary Members numbered two hundred and thirty-one. The deaths of seven, and the resignations of twenty-three, the majority of whom left the neighbourhood, reduced the number to two hundred and one; but the election of twenty-three new members raised the number to two hundred and twenty-four, which constitutes the present strength of the Society.

"Of the gentlemen deceased, the Society has especially to lament the loss of two of its most prominent members—Dr. Inman, one of the Ex-Presidents, and Mr. Arnold Baruchson, formerly one of the Vice-Presidents.

"Dr. Inman's membership had extended over the space of thirty-two years, and had been distinguished by many valuable services to the Society, not only in the offices which he had held, first as Honorary Secretary, and afterwards as President, but in contributions to its *Proceedings* and in donations to its Library. In the Index of Authors, annexed to the twenty-sixth volume of the Society's *Proceedings*, Dr. Inman's name appears at the head of sixteen papers down to 1871, since which year he has contributed two others, one of which was read only in the last Session. The donations which Dr. Inman presented to the Society consisted of his own works, which were numerous, and of the *Annual Report of the British Association*—a volume which he never failed to place before the members at the earliest opportunity after its publication. The geniality and good humour which he threw into the discussions of the Society marked his conduct as President, and the Council feel that his loss is one which cannot readily be repaired.

"Mr. Arnold Baruchson, whose death the Council has likewise to record, had been connected with the Society for fourteen years, and had also contributed papers to its *Proceedings*. He was a very frequent attendant at the Ordinary Meetings, and always took an active interest in the Society's concerns.

"Among the gentlemen whose connexion with the Society has been terminated by their removal to other localities, the name of the Rev. Dr. Kennedy-Moore, recently a Vice-President, demands honourable mention in this Report. His contributions to the *Proceedings* were both learned and

graceful, and the readiness and ability with which he entered into almost every discussion at the Ordinary Meetings will long be remembered.

"The number of Honorary Members now on the Society's roll is thirty-seven; of the Corresponding Members, fourteen; and of the Associates, seventeen.

"The Society continues to receive many valuable donations from the Associations and Institutions with which it exchanges *Proceedings*, and the number of these has increased during the last twelve months. The Council, therefore, has much pleasure in again directing the attention of the members to the many rare and excellent works which are at their disposal.

"Towards the close of the last Session, the Council received an intimation from the Committee of the Royal Institution that the Society could no longer be favoured with the free use of rooms in their building, and that, with the commencement of the Session of 1876-77, a rental of £20 per annum would be required. This serious call upon the Society's resources, after it has been in the free and undisturbed occupation of the said rooms for nearly sixty years, has taken up much of the time and attention of your Council since it was first made. A representation of all the circumstances under which the Society was freely located in the Royal Institution has been made to the Committee, and they have promised to reconsider their demand at their next meeting. Understanding, however, from the Rev. H. H. Higgins, that the payment of an annual contribution would be acceptable under present circumstances to the Royal Institution, your Council have to recommend that the sum of £20 be so contributed, in acknowledgment of the use of the rooms as at present occupied by this Society.

"The Council have now to conclude their Report with the customary recommendation of five gentlemen for election on

the new Council. They have selected the following:—  
Messrs. Higgin, Young, Palmer, Josiah Marples, and  
Hayward."

The Report was approved of and adopted, on the motion of Mr. Alfred Higginson, seconded by Mr. Isaac Roberts.

The Hon. Treasurer next submitted his Annual Statement of Accounts, which was passed, on the motion of Mr. Birch, seconded by Mr. Kinsman.

The election of Office-bearers and Members of Council was then proceeded with, and the following gentlemen elected: Vice-Presidents — Alfred Higginson, M.R.C.S., Thomas J. Moore, Cor. Mem. Z.S.L., John J. Drysdale, M.D., M.R.C.S.; Honorary Treasurer—Richard C. Johnson, F.R.A.S.; Honorary Secretary—James Birchall; Honorary Librarian—Alfred Morgan; Members of Council—J. Campbell Brown, D.Sc., &c., Alfred E. Fletcher, F.C.S., W. Carter, M.B., Rev. E. M. Geldart, M.A., Edward R. Russell, Edward Davies, F.C.S., C. H. Stearn, George H. Morton, F.G.S., Baron Louis Benas, Thomas Higgin, F.L.S., John Linton Palmer, F.S.A., F.R.G.S., Josiah Marples, John W. Hayward, M.D., Sibley Hicks, F.R.C.S.

The Associates of the Society were next re-elected.

It was then moved by the Honorary Secretary, seconded by Mr. A. Higginson, and carried:—"That in consequence of the Meeting of the Social Science Congress in Liverpool, the first Ordinary Meeting of the Society should be adjourned to the 24th of October; the succeeding meetings following in due course of law."

The President then read his Second Inaugural Address,\* for which a vote of thanks was carried by acclamation, on the motion of the Rev. H. H. Higgins, seconded by the Rev. E. M. Geldart.

Ladies were present at this Meeting.

\* See page 1.

**FIRST ORDINARY MEETING.**

ROYAL INSTITUTION, October 24th, 1876.

JAMES A. PICTON, F.S.A., PRESIDENT, in the Chair.

The Rev. Dr. Stearn was elected an Ordinary Member.

A Conversazione on Natural Science was then held, and the following subjects were brought before the Society :—

**ARGO COLLECTION.**

Numerous specimens were exhibited from the collection made for the Liverpool Free Public Museum by the Rev. H. H. Higgins, during his recent cruise in the West Indian Seas, as the guest of Mr. Reginald Cholmondeley, of Condover Hall, on board the Royal Mersey Steam Yacht *Argo*.\*

The following communication was read :—

**ON THE SPONGES OF THE ARGO EXPEDITION.**

By THOMAS HIGGIN, F.L.S.

The Sponges which we have before us this evening are most of them perfect examples of rare and not easily obtained species, and some of them are new to science.

The large collection brought home by the Rev. Mr. Higgins from the various places visited by the "Argo," from which those we now see have been selected, will require months of patient work before the different specimens can be described and named. They are in excellent condition, having the sarcodite preserved with the skeleton, either in a dried state or in spirits, and they therefore possess all the

\* See page 405 for the history of this Expedition.

microscopic parts necessary for the distinguishing of species. It is, unfortunately, too often the case with specimens offered by dealers, that they have been ruined by the washing to which they have been subjected, with the intention of cleaning them and giving them a better appearance ; but the "Argo" Sponges, dredged by Mr. Higgins, are all in the best state of preservation, and they therefore possess a value which they would not have had if they had been obtained by a less experienced collector. The careful examination of them may be expected to produce many new species.

*Dactylocalyx pumiceus*.—The large, rigid, glassy, cup-shaped Sponge, from Grenada, is an excellent example of the species known by this name, and it is probably the first specimen which has been brought to this country with the sarcode about it. In a small portion sent to Mr. H. J. Carter, F.R.S., he has been able to ascertain that a fine lattice-work of small hexradiate spicules covers the whole surface of the Sponge, supporting the dermal sarcode, a feature which the examination of other similar species led him to look for, but which is not observable in the previously known specimens denuded of their sarcode, together with its fine spicules. This Sponge belongs to the group styled by Professor Wyville Thomson, *Vitreous* Sponges, and to the family which Mr. H. J. Carter has named *Vitreo-hexactinellida*. The spicules, as this name denotes, are of the hexradiate or six-rayed type, and those which form the skeleton are surrounded and held together by amorphous siliceous material, deposited about them after they have been placed in position by the sponge organism, and thus the rigid, glassy structure is produced.

Almost all Sponges possess a skeleton for the support of the soft parts of the body; in the case of the Sponge of commerce, the skeleton is a network of resilient horny material, which yields to pressure, and resumes its natural

form again so soon as the pressure is withdrawn ; in another family, of which we have an example before us in the beautiful yellow Sponge of tubulo-digitate form, also from Grenada, the skeleton is less elastic than that of the common Sponge, the want of elasticity being due to the presence of siliceous spicules lying in the horny material. In other species we find this core of siliceous material increasing in amount until almost all the horny material has been displaced by it, and the entire network is a mass of these raphides-like bodies, held together by a minimum quantity of horny material ; and such Sponges consequently possess only that small amount of elasticity afforded by the hardened sarcode, which in them exists in quantity barely sufficient to hold the spicules together. In the vitreous Sponges, the spicules, instead of being held together by *horny* material, are embraced by *siliceous* material, and thus the skeleton is rendered in their case perfectly rigid and glassy. In observing the development of the ova and embryos of Sponges, it was first noticed by Mr. H. J. Carter that the spicules are carried about by the general sarcode, and by it placed in position necessary for the building up of the skeleton structure, after which the cementing material is deposited about them. In the *Euplectellidæ* we have an instance in the Liverpool Museum of a vitreous Sponge, in which all the spicules necessary for the creation of that beautiful and symmetrical form which has been called the "Flower Basket of Venus," are placed in position ready for the vitreous material to be accumulated about them, but only here and there has it begun to be deposited. This interesting specimen, which was one of the first to be brought to this country, affords a good deal of information as to the way in which these beautiful forms are built up, and shews that what has been seen to take place in the fresh-water Sponge, and in the littoral Sponges of our own coasts, also takes place in these vitre-

ous Sponges, namely, that first the spicules are developed, and then they are placed in their positions necessary to form the skeleton structure, after which they become fixed by having accumulated about them the amorphous hardened material. This large specimen of *Dactylocalyx pumiceus* is the most perfect example hitherto seen; the small Sponge, which is a washed specimen, is in the condition of those in the British Museum, and is similar to them in size and form.

*Halichondria birotulata*.—The dark purple massive Sponge, to which this name has been given, is a new species. This species was first made known to us by Capt. J. A. Perry, who, a couple of years ago, brought over fragments of a Sponge which he had seen in the possession of Dr. Allen, o Jamaica; it was found to be new to science, and since then efforts have been made, but hitherto without success, to obtain a perfect example from that locality. The "Argo" specimens were obtained by Mr. Higgins at Puerto Cabello, on the coast of Caraccas, the southern side of the Caribbean Sea, and opposite to Jamaica. Most of these are of a massive spreading growth, but some take the form of groups of pyramidal prominences, whilst the Jamaica specimen is of a branched procumbent form. This Halichondroid Sponge has flesh spicules of the multihamate shape, each rotulate head having twelve hooks, and it is the first species of the family which has been found to possess them; but, since they were observed in it, Mr. H. J. Carter has noticed them in a deep-sea Sponge, dredged during the cruise of the "Porcupine," to which he has given the name *Halichondria Abyssi*.

*Patuloscula procumbens*.—This pretty yellow Sponge is an admirable specimen of a species of which several imperfect examples exist in the British Museum. It has received its generic and specific name from Mr. H. J. Carter, and will

be described by him in the third part of his *Notes on Spongida*, shortly to be published, which will be principally a catalogue of the British Museum Sponges. Mr. Higgins brought home two perfect specimens of slightly different growth, one of which has been presented to the British Museum, to be labelled "Argo Expedition," and the Liverpool Museum one will be the type specimen of the new species. I have already stated that the fibre of this Sponge is horny material, with a core of needle-shaped spicules.

*Higginsia coralloides*.—This very pretty coral-like Sponge from Grenada is of a new genus as well as species. In 1873, Mr. Higgins brought to the Museum, from Bantry Bay, a few Sponges obtained some twenty miles from Glengariff, one of which had a spicule complement differing from that of any known species, and, whilst he was away on the "Argo" cruise, some Sponges from Cape Palmas were presented by Mr. Keen, one of which was evidently of the same genus as the Irish Sponge. On sending the particulars to Mr. H. J. Carter, it was ascertained that several examples of the same genus, also from the Coast of Africa, existed in the British Museum. That gentleman advised that the genus should be at once named, and suggested that it should be called *Higginsia*, in compliment to the Rev. H. H. Higgins, the finder of the first species. Strange to say, shortly after, when the "Argo" had arrived, and her specimens had been unpacked, one of the prettiest Sponges in the collection proved to be a species of this new genus, and it has now been duly christened *Higginsia coralloides*\*. It is one of the *Ectyonida*, the first family in Mr. Carter's order *Echinonemata*.

*Luffaria* (new species).—This amber-coloured Sponge is one of the genus *Luffaria*, of which there are several excellent specimens in the collection from various places. It

\* See *Annals and Mag. Nat. Hist.*, 4th ser., vol. xix., p. 291.

will receive a specific name when the whole can be carefully examined, classified, and arranged.

The Rev. H. H. HIGGINS exhibited select specimens of Shells, Mosses, and Lichens from the Expedition, and made the following communication :—

ON LOWER CRYPTOGAMIC PLANTS, ETC., OF  
THE ARGO EXPEDITION.

BY THE REV. H. H. HIGGINS, M.A.

The following notes on Lower Cryptogamic Plants, found in the island of Dominica, are selected from amongst many others, which may, I hope, when completed, appear in a collected form. *Hookeria aurea*, of Mitten. This beautiful moss grows in tufts to the height of three or four inches. When fresh the plant is of a pearly maize colour, varying to a pale straw colour, with a peculiar translucent appearance. Some of the stems and leaves are marked with sharply defined blotches of purplish crimson. In consequence of this peculiarity I sent specimens of the moss to Paris, for examination by M. Emille Bescherelle, of the Botanical Society of France, who has recently published a beautiful monograph of the mosses of the French Antilles. He identified it as *Hookeria aurea*. No one of the many authorities who have seen and described *H. aurea* has noticed the occurrence of colour patches, which I therefore regard as peculiar to specimens from Dominica, where it has not previously been found. In the classification adopted by Mr. Mitten, the plant is assigned to the genus *Hookeria*, but it seems probable that its natural affinities are with *Hypnum scorpioides*, *H. revolvens*, and *H. Lycopodioides*, natives of this country; all of which are mosses found in watery places, and are often deeply stained with purplish-crimson. The excessive moisture prevalent in Dominica has apparently

developed in *H. aurea*, elsewhere uniformly coloured, a character of peculiar staining, found also in its close allies. In the drier Antilles the distinctive colouring of the group is absent in *H. aurea*; in Dominica it is present. The circumstance is noticed as an instance of what may be termed a latent character, and as suggestive of the importance of characters derived from colour. I tested the coloured portions of the *Hookeria* and of *Hypnum revolvens* by the application of hydrate of potash, and came to the conclusion that the colouring matter in both plants was of a similar kind

The following is an extract from a very kind note which I received from M. Bescherelle:—

'No. 2.—(*Ectropothecium*, tibi) est une espece d'*Hookeria*, très voisine de l'*Hookeria leiophylla* mihi, de la Martinique, et que je vous demande la permission de nommer *H. Higginsiana*. Elle fait partie d'une nouvelle section que j'ai nommée *Hookeridium*.'

Believing the moss to be new, I had proposed for it the name *Ectropothecium vernicosum*. It must now stand as *Hookeria (Hookeridium) Higginsiana*, Bescherelle. The following description by myself is, of course, provisional, awaiting the authentic description by the author of the species.

*Hookeria (Hookeridium) Higginsiana*, Bescherelle. *Dioica; caulis procumbens irregulariter sub-pinnatim ramosus; rami ascendentes; folia parum falcata, disticha, breviter binervia, lanceolato-acuminata, integerrima; capsula in pedunculo rubro nutans; dentibus peristomii pallidis; ciliis usque ad medianum coalitis; operculum recti-rostratum.*

Island of Dominica. Found abundantly in fruit, and growing in neat tufts; or clothing the surface of stones, and varying in colour from the lightest to the darkest shades of shell-lac.

A very beautiful little moss, much resembling some of the British species of *Campylopus*, occurred in tufts of moderate size rather plentifully in Dominica. The leaves were rigid and bristle-pointed, and the very short fronds,

shaped like a closed parasol, were delicately shaded from fawn colour to primrose. Most of the stems ended in long plumes like the seed-plume of the feather-grass, *Stipa pennata*. On examining my large bundle of dried mosses from Dominica, this plant was not to be found; but it soon became evident that the tufts had been broken up into single stems, and that these had travelled in all directions through the dried mosses, so that two stems were rarely found together.

This was evidently an instance of a natural locomotive contrivance designed for the distribution of the plant; as in the case of the seed popularly called the animated oat, which will work its way up one's sleeve, or, in its natural condition, will travel through dried stems of grass to a considerable distance. Contrivances for the distribution of seeds in the higher orders of plants are very numerous, and of the most varied character; but such contrivances have been much less frequently noticed amongst cryptogamic plants.

Many mosses with rigid bristle-pointed leaves are in the habit of shedding single stems, which often lie scattered on the surface of the tuft till the wind wafts them away; and when they fall amongst the dried stumps of grass, they are able to travel till they find a suitable resting-place. There are two very interesting points in the economy of these locomotive mosses. Some of them very rarely produce capsules, as in some species of *Campylopus*; and being thus without spores, they are entirely dependent on their locomotive appliances for the distribution of their species. Others bear capsules on footstalks, curved like the neck of a swan, as in some species of *Campylopus* and *Grimmia*, so that the spore-case sheds its spores on the plant itself, which, being capable of motion, bears away the spores to a spot suitable for germinating. Other mosses have erect footstalks, which hold up the capsule for the spores to be disseminated by the wind.

M. Bescherelle determined the *Campylopus*-like moss from Dominica as *Neckera trichophylla*. I was unable to send him fruiting specimens, not having found any ; but his authority is quite sufficient, and the name confers a great additional interest on the plant, the *Pleurocarpous Nekereæ* being so far removed from the other locomotive mosses, which belong to the acrocarpous division.

Upon the subject of the passage of plants across the Atlantic, the following remarks may be interesting :—

Professor Unger arrived at the conclusion, that in Tertiary times there was a passage of plants from America to Europe. A plant found by myself last year in the Island of Dominica, West Indies, led me to think it probable that there had been an extension of at least one plant in the opposite direction. The plant to which I refer is one of the Hepaticæ, *Haplomitrium Hookeri* of Lyell. It differs so much from other Hepaticæ that I was able approximately to identify it on the spot, where I found it in considerable abundance. Should it prove to be specifically distinct, my remarks may still, to some extent, hold good. It was growing in a dark, moist, shady spot on the north side of a mountain, at an elevation of about 4000 feet. *H. Hookeri* is generally distributed over the North of Europe, but I cannot find that it has ever before been found out of Europe. Dr. Oliver kindly informs me that there are only European specimens in the Herbarium at Kew. I have failed in obtaining information of its occurrence either in North or South America, or in the intermediate islands. Nees ab Esenbeck, in his *Synopsis Hepaticarum*, whilst recording a large number of Hepaticæ from the West Indies, mentions *H. Hookeri* only from Europe. Now it is by no means an inconspicuous plant, and it seems altogether unlikely to have been overlooked by such careful observers as Swartz and others, who

have studied the Hepaticæ of the West Indies. Hence I draw the following inferences, to which may be attached a greater or a less amount of probability. 1. That the biological centre for *H. Hookeri* is Northern Europe. 2. That it has thence crossed the Atlantic in a rather narrow zone. 3. That it did not reach the Continent of America. This, of course, is subject to correction; it may have been found there. From the great extent of territory and variety of climate on the mainland, I think if it had ever reached America it would still be found there. 4. That it may have reached the West Indies, and have died out from Cuba, Jamaica, and other islands, through the prevalence of dry seasons, before the lower Cryptogamic plants were studied by competent botanists. 5. That it has remained in Dominica because of the altogether peculiar moisture of the climate in that island. 6. That it has not hitherto been found in Dominica because, from some reason unknown to myself, botanists seem to have neglected this *true* pearl of the Antilles, matchless in the beauty of its natural scenery and in the wealth of its Cryptogamic flora.

*H. Hookeri* is noticed as peculiar in not recovering its freshness when moistened after having been dried. This I found to be the case. On being carefully moistened about eight months after it was collected and dried, it remained flaccid, whilst the rest of the mosses and Hepaticæ from Dominica, when similarly treated, looked as fresh as when they were gathered. But *H. Hookeri* exhibited another peculiarity even more remarkable, for it alone of all the Muscineæ that I brought home, grew and produced fruit after so long a period of desiccation. The fruiting parts of a specimen which I sent to the Herbarium at Kew were entirely developed in a moist case on the table at which I am now writing. It seems as if the plant, incapable of the imbibition or intus-susception of moisture sufficient to restore the freshness of

its foliage, nevertheless retained, in a very unusual degree, its capacity for such development as might secure the continuance of its species. Such a peculiarity no doubt favours the suggestion that *H. Hookeri* may have crossed from the East. I found many mosses in Madeira, and several lichens in Jamaica, which I have been quite unable to distinguish from British species; these may be common cases of widely distributed forms. *H. Hookeri* does not appear to be of this class.

This little plant is the subject of a most elaborate memoir in *Nova Acta*, vol. xxii., part 1, by Dr. Gottsche, occupying 120 closely-printed quarto pages, and illustrated by 8 plates. He does not, I believe, mention its occurrence out of Europe.

### SUMMARY OF THE FISHES OF THE ARGO EXPEDITION.

By THOMAS J. MOORE.

The following is an approximate summary of the Fishes obtained during the voyage:—

		Species.	Specimens.
Madeira	- - - - -	20	32
Crossing the Atlantic	- - - - -	2	9
Antigua	- - - - -	5	9
St. Vincent	- - - - -	8	16
Grenada	- - - - -	8	20
Trinidad	- - - - -	13	40
Gulf of Paria	- - - - -	8	8
Santa Marta	- - - - -	4	21
Nassau	- - - - -	19	68
		—	—
		<b>82</b>	<b>228</b>
		<b>=</b>	<b>=</b>

## SECOND ORDINARY MEETING.

ROYAL INSTITUTION, October 30th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Messrs. Richard Bulman, M'Grath, M.D., J. H. Johnson, F.G.S., J. H. Nickson, and A. Weightman were elected Ordinary Members.

The return of the Arctic Expedition gave rise to a discussion on the discovery of Fossil Corals and Coal at Disco Island, as proofs of the Arctic Regions having at some former period been under a warmer climate.

Mr. T. J. MOORE exhibited a collection of Arms and Weapons taken at the Siege of Moultan in 1849, kindly lent for the purpose by Major-General Bellasis.

Dr. WHITTLE exhibited a specimen of Manganese, and Mr. STEARN a specimen of Gallium, the new element discovered by M. Lecoq de Boisbaudran, in August, 1865.

The Rev. T. P. KIRKMAN, M.A., F.R.S., then read a Paper on "How we come to know."\*

Ladies were present at this Meeting.

## THIRD ORDINARY MEETING.

ROYAL INSTITUTION, November 13th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Messrs. G. H. Ball, T. E. Stephens, E. W. Yates, and T. Carson, M.D., were elected Ordinary Members.

\* See Page 803.

A communication was received from the Council recommending the alteration of the twenty-second law, so as to abridge the term of the Presidential Office to two years. The matter was referred to an Extraordinary Meeting, to be held on the 27th of November.

Mr. T. J. MOORE exhibited two specimens of Isopod Crustaceans (*Cymothoæ*), attached within the under jaw of a fish from Jamaica, collected by Capt. Perry, Associate of the Society, who made some remarks thereon.

Mr. WOOD exhibited two works on the British Marine Algae, by Mr. Grattan, of Torquay.

Mr. A. J. MOTT then read a Paper on "Haeckel's History of Creation."<sup>\*</sup>

Ladies were present at this Meeting.

#### FOURTH ORDINARY MEETING.

ROYAL INSTITUTION, November 27th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

The President exhibited photographs of the title-pages of two of the earliest books printed in Liverpool, namely, "*Hymns Sacred to the Lord's Table*, collected and methodised by Charles Owen, Liverpool. Printed by S. Terry for Daniel Birchall, 1712;" and "*The Prospect of Hearen, the Support of Afflicted Christians*, consider'd and improv'd in a Funeral Sermon at St. Hellen's Chappel (some time ago) upon the death of Edward Potter of Rainhill, a Young Man who died beyond Sea. By the late Reverend Mr. James Naylor. And now upon the Request of the Deceas'd's Father, Prefac'd and Published by Charles Owen. Printed at Liverpool for Daniel Birchall in Castle St. in 1713."

\* See Page 41.

Mr. A. HIGGINSON read an extract from a letter received from a lady in Berlin (19th November, 1876), describing the present condition of the young Gorilla which was lately landed at Liverpool and conveyed to the Prussian capital.

Dr. NEVINS then read a Paper on "Some Phases of Modern French Thought."\*

Ladies were present at this Meeting.

Previous to the above ordinary business, an EXTRAORDINARY MEETING was held, the President in the Chair, to consider for the first time the following alteration of the twenty-second law :—

" That the President shall be elected by the Society at the last Meeting of every *alternate Session* (instead of *Third Session*). His term of office shall be *two* (not *three*) years, commencing at the Annual Meeting following his election."

The alteration was proposed by the President, who explained the circumstances which he considered rendered it desirable to make the change. The Honorary Secretary seconded the motion, and it was carried by a large majority.

It was then proposed by Mr. UNWIN, seconded by Mr. YATES, and agreed to, "That at the next Extraordinary Meeting the Society should take into its consideration the advisability of meeting at half-past six, instead of seven o'clock, as prescribed by Law 45."

## FIFTH ORDINARY MEETING.

ROYAL INSTITUTION, December 11th, 1876.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Mr. Richard Roberts and the Rev. Lorenzo Torpy, M.A., were elected Ordinary Members.

\* See Page 128.

The President exhibited a copy of "*Britain's Remembrancer, &c.*," published by Bryan Blundell, Esq., and sold for the benefit of the Blue Coat Hospital, in Liverpool, 1755."

Mr. LEWIS HUGHES exhibited and explained the construction of Browning's Akribetic Galvanometer on Ridout's Patent.

Mr. T. J. MOORE exhibited a Diamond *in situ*, in "Maiden Blue," lately presented to the Museum by Mr. J. Vernon Hope, from the Kimberley Mine, Griqualand West, South Africa, who briefly described the methods of mining there practised.

Mr. CHANTRELL gave the following analysis of the "Maiden Blue," as determined by his son, Mr. H. W. Chantrell.

#### ANALYSIS OF "MAIDEN BLUE."

Silicic acid . . . . .	40.62
Oxide of alumina . . . . .	21.33
Water . . . . .	10.15
Insoluble in everything (sand, grit, &c.) .	8.94
Magnesia . . . . .	7.20
Oxide of iron . . . . .	5.89
Organic matter . . . . .	4.56
Lime . . . . .	1.50
Phosphoric acid . . . . .	.89
Sulphurous acid . . . . .	.15
<hr/>	
	101.23

Chiefly silicate of magnesia, iron, and alumina, with traces of sulphate and phosphate of lime.

Mr. STEARN exhibited two new forms of the Sprengel Pump, with single and double fall tubes, and by means of the cessation of an induction current in a vacuum tube, and

the increase in speed of rotation in a Radiometer, illustrated the perfection of the exhaustion produced by the apparatus.

Mr. JOSIAH MARPLES then read a Paper on "Type Founders and Type Founding."\*

Ladies were present at this Meeting.

AN EXTRAORDINARY MEETING was held the same evening, the PRESIDENT in the Chair, when the change in Law 22, as proposed at the previous meeting, was finally carried.

The following resolution, proposed by Mr. UNWIN, and seconded by Dr. NEVINS, was also carried for the first time:—

"That the business of each Ordinary Meeting shall commence at *Half-past Six* (instead of *Seven*) o'clock, provided the Society be duly constituted at that time."

Law 45.

## SIXTH ORDINARY MEETING.

ROYAL INSTITUTION, 8th January, 1877.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Mr. James Ogston was elected an Ordinary Member.

Mr. JOHN MILLER exhibited a copy of an Autotype reproduction of John Milton's "Common Place Book," the original of which was in the possession of Sir Frederick Graham.

Mr. J. L. PALMER, F.S.A., F.R.G.S., Fleet Surgeon R.N., read a Paper on "The Marquesans—their History, Traditions, and Customs."†

Ladies were present at this meeting.

AN EXTRAORDINARY MEETING was held the same evening to consider, for the second time, the proposed alteration in Law 45.

\* See Page 147.

† See page 271.

After some discussion, the proposition, on being put, was lost by a large majority.

## SEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, 22nd January, 1877.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

The PRESIDENT drew the attention of the Meeting to an article in the current number of the *Quarterly Review*, on "The Geographical Results of the Arctic Expedition," with special reference to the causes therein assigned for the existence of fossil tropical plants in the Polar Regions.

The remainder of the evening was devoted to the discussion of Mr. Mott's Paper on "Haeckel's History of Creation."\*

Ladies were present at the meeting.

## EIGHTH ORDINARY MEETING.

ROYAL INSTITUTION, 5th February, 1877.

ALFRED HIGGINSON, M.R.C.S., VICE-PRESIDENT, AND EDWARD R. RUSSELL successively occupied the Chair.

Mr. CHANTRELL exhibited the "Patent Electric Pen," and distributed specimens of writing produced by it.

A communication was received from the Council recom-

\* See page 91.

mending the election of Professor F. V. Hayden, M.D., United States Geological and Geographical Survey, as an Honorary Member, and of Mr. Arthur B. Nevins as an Associate.

Mr. JOSEPH BOULT then read a Paper "On the Suffix -ster."\*

#### NINTH ORDINARY MEETING.

ROYAL INSTITUTION, 19th February, 1877.

ALFRED HIGGINSON, M.R.C.S., VICE-PRESIDENT,  
in the Chair.

Professor F. V. Hayden, M.D., Director of the United States Geological and Geographical Survey, was elected an Honorary Member, and Mr. Arthur B. Nevins an Associate.

Messrs. Douglas R. Samuel, T. D. Rich, John Wallace, M.D., W. Marples, R. P. Thacker, and the Rev. Henry Gardiner were also elected Ordinary Members.

Mr. J. L. PALMER, R.N., F.S.A., etc., read the following extracts from a letter written by Mr. John Adams, of Pitcairn's Island, giving an account of a supposed Sea Serpent, as seen by him and a boat's crew off that island :—

##### [EXTRACT.]

Letter from JOHN ADAMS, Grandson of JOHN ADAMS, Quartermaster of H.M.S. "Bounty," off Pitcairn Island.

" Norfolk Island, January 7th, 1874.

\* \* \* \*

"About the Sea Serpent seen off here, I give it you as it really was. But I must first tell you, that in whaling it here we generally go under

\* See page 245.

sail, when no whales are seen, keeping a good look-out as we sail along; the boat-steerer, as the person is called whose place it is to strike the whale, standing up in the bows of the boat, looking out a-head and all round. Well then, on the 15th October, 1870, wind S.E. and light, our boat being a mile off Nepean Island, and on the port tack, our look-out reported a calf (as the young whale is called) about a mile and a half distant on the lee bow. We accordingly kept off, and when about one hundred yards from the supposed calf, he said—‘I cannot make out what it is; I have not seen a spout yet; but there is an animal of some sort, for his back is out of the water, and there is a wash there all the time.’ ‘Very well,’ was the answer; ‘keep a sharp look out.’ On we went till within a few yards of the object, when the look-out exclaimed—‘Look! it is a Sea Serpent!’ And look we did. The boat shot within a yard of it, and there it was, a veritable Sea Serpent. Let Professor Owen, or any Professor of Natural History, say that such a thing as a Sea Serpent could not exist, but there, before our eyes, and within a foot or so of us, lay a thing, a living confutation of their theory. When first seen, I suppose it must have been asleep, for its head was lying flat on the surface of the sea, and its body coiled up. The tail of the monster I saw plainly, hanging some three or four fathoms below the surface. When we came near it, the beast, if I may call it so, raised its head out of the water, looked at us, then slowly straightening himself, he very leisurely moved off. I cannot tell you with any certainty the length of it, for it was not lying with its whole length on the surface, but, as nearly as I could judge, it must have been thirty or forty feet. It is of a reddish colour, and about a foot or eighteen inches in diameter. We have been about the Island in boats almost every day when the weather is fine for nearly eighteen years, and have never seen anything like it before or since then.” \* \* \* \*

On the motion of Mr. JOSIAH MARPLES, seconded by the HONORARY SECRETARY, it was unanimously resolved to hold the Twelfth Meeting of the Society on the 9th of April, in consequence of the regular date falling on Easter Monday.

Mr. E. DAVIES, F.C.S., then read a Paper on “Popular Errors about Poisons.”\*

Ladies were present at the meeting.

\* See page 229.

## TENTH ORDINARY MEETING.

ROYAL INSTITUTION, 5th March, 1877.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Mr. JOSEPH MARPLES exhibited an apparatus for drawing Lissajous' Curves, on a simpler plan than that constructed by Messrs. Tisley and Spiller.

The Rev. T. P. KIRKMAN, M.A., F.R.S., then read a Paper on "The First Definition of the Scholastic Philosophy."\*

## ELEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, 19th March, 1877.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Mr. T. F. Parry and the Rev. H. I. Johnson, M.A., were elected Ordinary Members.

Mr. T. J. MOORE exhibited selections from a collection of specimens, chiefly marine, made by Capt. W. H. Cawne Warren, Associate of the Society, on a voyage to Australia, the Pacific Islands, and San Francisco.

Capt. CAWNE WARREN was present at the meeting, and gave various particulars as to the specimens before the Society.

The *Algae*, *Zoophytes*, and *Polyzoa* having been submitted to Miss GATTY for examination, that lady, who has inherited her mother's well-known love for these beautiful objects, has kindly arranged and named the specimens:-

\* See page 317.

LIST OF ALGÆ, HYDROZOA, AND POLYZOA, FROM PORTLAND  
BAY, VICTORIA, AUSTRALIA, COLLECTED BY CAPT. W. H.  
CAWNE WARREN, ASSOCIATE, AND NAMED BY MISS  
HORATIO K. F. GATTY.

## ALGÆ.

## MELANOSPERMEÆ.

FAMILY.	SPECIES.
FUCACEÆ . . . . .	<i>Scaberia Agardhii.</i>
SPOROCHNACEÆ . . .	<i>Carpomitra inermis.</i>
	" <i>caudata.</i>
DICTYOTACEÆ . . .	<i>Dictyota paniculata.</i>
	" <i>furcellata?</i>
	<i>Lobospira bicuspidata.</i>
	<i>Zonaria Turneri.</i>
ECTOCARPACEÆ . . .	<i>Sphacelaria paniculata.</i>
RHODOSPERMEÆ.	
RHODOMELACEÆ . . .	<i>Polysiphonia hystrix.</i>
	" <i>cancellata.</i>
	<i>Thuretia quercifolia.</i>
LAURENCIACEÆ . . .	<i>Delisia pulchra.</i>
	<i>Laurencia thuyoidea?</i>
CORALLINACEÆ . . .	<i>Amphiroa granifera.</i>
	" <i>stelligera.</i>
	<i>Corallina rosea</i> (Agardh).
	" <i>officinalis.</i>
	" <i>Cuvieri.</i>
	" " <i>var. crispata.</i>
	<i>Melobesia patena.</i>
SPHEROCOCCOIDEÆ . . .	<i>Melanthalia abscissa.</i>
	" <i>obtusata.</i>
	<i>Phacelocarpus Labillardieri.</i>
GELIDIACEÆ . . . .	<i>Gelidium glandulæfolium.</i>
	<i>Hypnea episcopalis.</i>
	<i>Pterocladia lucida.</i>

RHODYMENIACEÆ . . .	<i>Plocamium procerum.</i>
" "	<i>var. Mertensi?</i>
" "	<i>costatum?</i>
" "	<i>coccineum.</i>
" "	<i>angustum.</i>
CRYPTONEMIACEÆ . . .	<i>Callophyllis Lamberti.</i>
	<i>Chylocladia clavellosa.</i>
CERAMIACEÆ . . .	<i>Ballia callitricha.</i>
	<i>Crouania vestita.</i>
	<i>Dasyphila Preissii.</i>
	<i>Haloplegma Preissii.</i>
	<i>Ptilota rhodocallis.</i>
" "	<i>Jeanneretii.</i>
" "	<i>articulata.</i>

## HYDROZOA.

<i>Sertularia elongata?</i>	. . .	Lamouroux.
" <i>scandens?</i>	. . .	Lamouroux.

## POLYZOA.

## SUB-ORDER I.—CHEILOSTOMATA.

FAMILY.	SPECIES.
CATENICELLIDÆ . . .	<i>Catenicella margaritacea.</i>
"	<i>hastata.</i>
"	<i>cribaria.</i>
"	<i>perforata.</i>
"	<i>formosa.</i>
"	<i>lorica.</i>
"	<i>aurita.</i>
"	<i>plagiostoma.</i>
"	<i>ventricosa.</i>
"	<i>ringens.</i>
"	<i>elegans.</i>
"	(2 species undetermined.*)

- SALICORNARIIDÆ** . . *Salicornaria gracilis.*  
*Onchopora hirsuta.*  
     "     *tubulosa.*
- CELLULARIIDÆ** . . *Cellularia cuspidata.*  
*Scrupocellaria cervicornis.*  
     "     *cyclostoma.*  
     "     (iundetermined.\* )  
*Canda arachnoides.*  
*Emma crystallina.*  
     "     *tricellata?*
- GEMELLARIIDÆ** . . *Dimetopia spicata.*
- CABEREADÆ** . . . *Caberea Boryi.*
- BICELLARIIDÆ** . . . *Bicellaria tuba.*
- FLUSTRADÆ** . . . *Carbasea dissimilis.*
- MEMBRANIPORIDÆ** . . *Membranipora membranacea.*  
     "     *cervicornis.*  
     "     *pilosa.*  
     "     *stenostoma.*  
     "     *lineata.*  
     "     (2 species undetermined.\* )  
*Lepralia hyalina.*
- CELLEPORIDÆ** . . . *Cellepora* (2 species undetermined.\* )
- SUB-ORDER II.—CYCLOSTOMATA.
- TUBULIPORIDÆ** . . *Tubulipora* (undetermined.\* )
- SUB-ORDER III.—CTENOSTOMATA.
- VESICULARIDÆ** . . *Amathia polycystica.*  
     "     *cornuta.*

Mr. MOORE then brought forward various specimens collected and presented to the Museum by Capt. Slack, Associate of the Society, and drew attention, among the Fishes, to several examples, from Rio Janeiro, of the lowest

\* The undetermined species noted above, and one other, have been sent to Mr. Busk for further examination.

known form of all vertebrates, that of the Lancelet, *Amphioxus lanceolatus*; and, among the Radiates, to two fine specimens of *Encope* from the same locality. The *Algæ* and *Polyzoa* are enumerated in the following list:—

LIST OF ALGÆ AND POLYZOA COLLECTED IN 1876, BY CAPT.  
SLACK, ASSOCIATE, AND NAMED BY MISS HORATIA  
K. F. GATTY.

ALGÆ.

RHODOSPERMEEÆ.

FAMILY.	SPECIES.
CORALLINACEÆ . . .	<i>Melobesia mamillaris.</i> St. Vincent, Cape de Verdes.
"	<i>fasciculata</i> "
"	<i>Jania corniculata</i> "
HELMINTHOCLADEÆ	<i>Galaxaura lapideescens</i> "
SQUAMARIEÆ . . .	<i>Peysonnelia atro-purpurea</i> "

POLYZOA.

SCRUPARIADÆ . . .	<i>Aetea anguina.</i> Rio Janeiro.
BICELLARIADÆ . . .	<i>Bugula neritina.</i> "
MEMBRANIPORIDÆ . . .	<i>Membranipora Lacroixii.</i> St. Vincent, Cape de Verdes.
"	<i>calpensis.</i> Gibraltar Bay.
	<i>Lepralia coccinea.</i> "
"	<i>ciliata.</i> "
"	<i>cucullata.</i> St. Vincent.
"	<i>trispinosa.</i> "
CELLEPORIDÆ . . .	<i>Cellepora bispinosa.</i> Rio Janeiro.
"	<i>ramulosa.</i> Gibraltar Bay.
"	(undescribed ?)
ESCHARIDÆ . . .	<i>Eschara fuegensis.</i> Rio Janeiro.

Mr. MOORE also exhibited an extensive series of Marine Organisms, mostly minute, obtained by surface dredging by Capt. J. H. Mortimer, Senior Associate of the Society. They were chiefly comprised in small glass vessels of the kind used by Homœopathists ; and were collected in the Atlantic and Pacific when voyaging between New York and San Francisco in 1875-6. This collection was rich in surface Mollusca, especially in Pteropods.

In addition to these small objects, there were various specimens of *Phyllosoma*, *Velella*, *Porpita*, *Calycophoridæ*, *Salpæ*, &c., several being mounted and displayed with great care and success ; also small jelly-like masses, considered by Capt. Mortimer to be composed of *Collospheæ* and other *Thalassicolida*.

The stinging properties of the *Physalia*, or Portuguese Man of War, have long been a favourite study with Capt. Mortimer, who on this subject had made the following notes, and has preserved portions of tentacle for further use with the microscope.

NOTES ON PHYSALIA, BY CAPT. J. H. MORTIMER, ASSOCIATE,  
WITH REMARKS BY MR. W. J. SOLLAS, F.G.S., &c.

April 20th, 1876.—South Atlantic (2° So. 29.30 West). Caught a large *Physalia*, and was stung very badly by a piece of tentacle coming in contact with the skin between my fingers. To determine whether the effect would be the same on different persons, I tried it, with their consent, on the first and second officers, the carpenter, and the boy. The effect was alike in each, except that the amount of pain corresponded to the tenderness of the skin where applied, and that the boy was affected more than the men.

One piece of the tentacle that had been detached from the animal, and had been on the bottom of the basin for some thirty minutes, had not lost its power of contracting and

expanding, and when laid on the side of my finger, as being the tenderest part, in a few moments attached itself to the skin with a tenacity surprising in a detached fragment. One would have supposed it would have lost its vitality, but its fire was all there, and upon examining with the microscope the multitude of thread-cells which serve to attach it to any object it may desire to fasten to.

Subsequently, I noticed the note of Prof. Leidy appended to an article on *Physalia* in Dr. Harrison Allen's "Outlines of Comparative Anatomy," published at Philadelphia in 1874, and at my next opportunity again observed closely. I had caught a good-sized and brilliant rose-coloured *Physalia*. The whole of the tentacles were full of life, and contracted and expanded with a constant motion. I tried in different ways to preserve pieces of the tentacle on glass slides for mounting, but, as before, without success. The thread or tentacle would dry enough to adhere to the glass, but its contractile force would break it, and the whole length would resolve itself into a lump. At last I took a tentacle, and, without severing it from the animal, laid it over the edge of a basin and across the glass side, which was fixed on the stage of the microscope. Holding the end, and so viewing it under a half-inch power, I was at length rewarded by viewing, first the granules separating from the tentacles, and then suddenly myriads of cells apparently burst, the lasso threads (well-named) spreading in every direction, and forming a silvery frost-work on either side of the extended tentacle. Most of the threads, where the whole length could be seen, seemed still attached to the emptied capsules.

[The above notes, accompanied with specimens, having been placed in the hands of Mr. W. J. Sollas, during his sojourn in Liverpool as Cambridge Lecturer on Biology, and who is specially devoted to the study of these lower forms, he has kindly written the following remarks on Capt. Mortimer's

researches. These researches fully deserve all the encomiums passed upon them by Mr. Sollas, when it is borne in mind that they were made by Capt. Mortimer while discharging all the active duties of his profession. They also show how much may be done by a willing worker, notwithstanding the discomforts, inconveniences and interruptions daily attending life at sea, even under the most favourable conditions of a well-found and commodious sailing ship. T.J.M.]

9, Barton Terrace, Dawlish,

April 3rd, 1877

My Dear Mr. MOORE,

I have carefully read Capt. Mortimer's very interesting account of his observations on the tentacles and thread-cells of *Physalia utriculus*. They have evidently been very carefully and accurately made, and receive striking confirmation by anticipation at the hands of Professor Huxley, whose drawings and descriptions agree in a very remarkable manner with those of Capt. Mortimer. On plate X. of Huxley's *Oceanic Hydrozoa*, published by the Ray Society, a drawing is given of the whole tentacles (fig. 11), and magnified (fig. 12), to shew the reniform enlargements which are so conspicuous in Capt. Mortimer's mounted specimens; the thread-cells are given in fig. 12, *a* & *b*, charged and discharged, as also they appear in Capt. Mortimer's slide. The substance of the description given in the *Oceanic Hydrozoa*, is, that the tentacle is a "delicate narrow ribbon, composed of two layers (inner-skin, or *endoderm*, and outer-skin, or *ectoderm*); having transverse reniform thickenings at regular intervals (fig. 12). The substance of each thickening has a dark-blue colour and embedded within it are myriads of close-set, colorless, spherical thread-cells."

I am very much obliged for the opportunity which has been afforded me of examining these difficultly-obtained structures, and I hope you will allow me to express a wish that Capt. Mortimer may continue to favour us with an account of observations which he is able to make at sea, and which are all the more valuable for being obtained from the fresh specimens as soon as they are caught, and by an observer who is evidently as acute as he is painstaking.

Believe me,

Very faithfully yours,

W. J. SOLLAS.

The Rev. H. H. HIGGINS, M.A., warmly applauded the services rendered to Zoological Science by the Associates of the Society, the specimens exhibited from them, from time to time, being such as would be eagerly welcomed by any of the learned societies in London. He suggested that, by means of suitable drawings and descriptions in the Society's Volume of *Proceedings*, these specimens should be brought more prominently before the Society and the public.

Mr. G. H. MORTON, F.G.S., then read a Paper on "The Introduction of Geological Maps,"\* and was followed by Dr. NEVINS, who read a Paper "On the Translation of Συνίημι and its Forms, and of Ηγε μη with a Subjunctive Mood, in the Authorised Version of the New Testament."†

#### TWELFTH ORDINARY MEETING.

ROYAL INSTITUTION, April 9th, 1877.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

M. R. B. Hooper was elected an Ordinary Member.

The President exhibited a printed copy of the Roll of the Liverpool Volunteers in 1797, Thomas Earle, Captain, and read some amusing extracts from the rules and regulations of the Company.

Mr. ALFRED HIGGINSON exhibited and presented to the Society a copy of a Discourse delivered by William Roscoe on the opening of the Royal Institution, 25th November, 1817. The title of the discourse was "On the Origin and Vicissitudes of Literature, Science, and Art, and their Influence on the Present State of Society." Liverpool, 1817.

Mr. ABBOTT, B.A., proposed the question : "What part

\* See Page 298.      † See Page 167.

of the globe first registers a new day?" which gave rise to some discussion.

Mr. ALFRED MORGAN, Honorary Librarian, communicated a note respecting the "Origin and Progress of the United States Geological and Geographical Survey of the Territories."\*

Mr. MALCOLM GUTHRIE then read a Paper on "The Causalational Theory of Volition—a Reply to Strictures in Dr. Carpenter's Mental Physiology."

#### THIRTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 16th April, 1877.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Ladies were present at this meeting.

A discussion was held on miscellaneous topics, among others, on the alleged existence of an Intra Mercurial Planet; on the question propounded by Mr. Abbott at the last meeting and on the co-operative constitution of Sir Joseph Whitworth's Engineering Works.

The REV. H. H. HIGGINS submitted the Manuscript of "Liverpool Museum Report No. 1," devoted exclusively to the Mollusca of the Argo Expedition to the West Indies, 1876, as worked out by himself and Mr. F. P. Marrat.†

Mr. E. R. RUSSELL then read a Paper on "The Auto-biography and Memorials of Miss Martineau."‡

#### FOURTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 30th April, 1877.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

The PRESIDENT formally tendered his resignation, which was accepted by the Society, on the motion of the Rev. H. H.

\* See Page 357.

† See Page 405.

‡ See page 185.

HIGGINS, M.A., seconded by Mr. R. C. JOHNSON, F.R.A.S., Hon. Treasurer.

The Rev. H. H. HIGGINS then moved "that Dr. Drysdale, one of the Vice-Presidents, be elected President for the ensuing term of two years."

The motion was seconded by Mr. B. L. BENAS, and carried unanimously.

NOTES ON LEPIDOPTEROUS COCOONS AND LARVA CASES FROM  
SÃO PAULO, BRAZIL. BY MR. E. DUKINFIELD JONES, C.E.  
WITH A PLATE.

Mr. T. J. MOORE brought before the Society some interesting examples of Insect-Metamorphoses, recently brought from São Paulo, one of the southern provinces of Brazil, by Mr. E. Dukinfield Jones, who was present, and which that gentleman had kindly given to the Museum. Among them were several cocoons, probably of a species of Moth belonging to the family *Bombycidæ*. These were of hard texture and various colour, one being grey and the others yellow or brown. They measure in greatest length 2 inches, and  $\frac{1}{2}$  in greatest diameter.

Mr. Jones had furnished a drawing, showing the mode of suspension of these cocoons,\* accompanied by the following note :—

"While in the larva state, the insect attaches the case temporarily by threads to the twigs of the tree on which it feeds. The threads are somewhat loosely fixed, so as to allow of considerable movement of the case. When the larva has eaten all the leaves thus within its reach, it loosens the threads and moves to another place. Before changing to the pupa state, the case is fixed permanently with silk and mucilage to a twig."

Beside the above, there were also larva-cases of three

\* See accompanying Plate.





species, apparently belonging to *Oiketicus*, a genus of Moths found in various parts of the world, in which the females are entirely wingless. The largest case measures 5 inches in length, and 1½ inch in diameter. It contains a number of pieces of twigs, three-fourths of an inch and more in length, worked up into and forming a silken tubular bag, covered with an unbroken surface of finely-spun silk, of a brown colour.

Mr. Jones has supplied the following history of this large specimen :—

#### OIKETICUS.

This specimen was found between São Paulo and Jacareby, in the province of São Paulo. The Caterpillar was very lively, and was constantly crawling about with great activity, protruding its head, and then drawing the case up after it in the manner of the Caddis-worm, which it much resembles in its movements.

On one occasion it crawled up the smooth surface of a looking-glass, without losing or emerging from its case, spinning a ladder of silk, which adhered firmly to the glass.

I placed it on a small tree in my garden, where it remained for two or three months stationary, having firmly attached itself to a twig by silk and mucilage, which entirely closed the anterior aperture of the case.

I brought the specimen to England, in July, and upon arrival, found the pupa had come out of the case. Keeping this in a warm place, the perfect wingless grub-like insect came out in September, and is now in the Free Museum.\*

Mr. ALFRED MORGAN, Hon. Librarian, read a Paper on “The Cliff Houses and Antiquities of Colorado and New Mexico,”† and was followed by the HON. SECRETARY, who read a Paper by Mr. REDISH on “The Silver Question.”‡

\*An able paper by Prof. Westwood, describing and figuring several species of this remarkable genus of Lepidopterous Insects, will be found in the *Proceedings of the Zoological Society of London*, for 1854, pp. 218-248. Plates, *Annulosa*, xxxiv.-xxxvii.

† See page 348. ‡ See page 367.



**PAPERS READ DURING SESSION.**



## OPENING ADDRESS.

By JAMES A. PICTON, F.S.A.

IN the Address which I had the honour of delivering at the opening of last Session, I ventured to bring under notice the direction and tendency of the complicated interaction of circumstances, motives, and principles which are constantly operating, with varied results, in the current of human affairs; or, in other words, "the tendencies and future of modern civilisation."

The subject of human progress, in all its bearings, is a fruitful and never-ending theme. The present, however important and pregnant with results, can only occupy a limited portion of our thoughts. Reflection on the past, and speculation on the future, will ever form the most powerful motives to human action. According to the words of one of our great moralists:—"Whatever abstracts our minds from the present, and carries them into the distant past, or the remote future, advances us in the scale of thinking beings."

On the present occasion I wish to penetrate, in a certain direction, into the mystery and darkness in which the earliest period of the human race will ever be shrouded. In doing so, it is not my intention to trespass on the ground which has already been so ably occupied by my predecessor in several of his presidential addresses. There are various aspects in which the dawn of human progress may be contemplated, and various sources of information applicable to these points of view. Written records soon fail us. Tradition and mythology supply a copious flood of archaic utterances, which must remain mysterious, vague, and uncertain,

until some modern Oedipus shall arise to solve the riddle of the Sphynx.

Amongst the visible remains of the works of man's brain and hands we tread with more confidence. We can pass beyond the historical period; and, travelling back through the mighty remains of Egypt and Assyria, Baalbec and Palmyra, we can speculate on the relics brought to light of ancient Troy. The lake dwellings afford a still more primitive aspect of human society. The cromlechs, the barrows, the stone circles, the various sepulchral remains, all contribute their information as to the habits and condition of those who constructed them. Still further back, we arrive at the cave dwellings of a period when man struggled for existence with the mammoth, the hyæna, and the cave bear, until, finally, we arrive at the palæolithic fragments of the valley of the Somme, where the earliest indications of the human race seem to be identified with the glacial period in the geological series.

On this aspect of the problem I am not about to enlarge. It has been ably treated by many eminent writers, such as Sir John Lubbock,<sup>1</sup> Mr. Tylor,<sup>2</sup> Dr. Evans,<sup>3</sup> Dr. Daniel Wilson,<sup>4</sup> Mr. Llewellyn Jewitt,<sup>5</sup> and others.

However interesting this study may be, and useful in throwing light on the early condition and progress of the human race, the element of continuity is wanting, the thread of connexion is hopelessly broken. It is almost startling to find that the Kasia tribes in Hindostan are still constructing cromlechs, stone circles, and maenhirs, which it would be difficult to distinguish from those of Wales, Cornwall, or

<sup>1</sup> *Origin of Civilisation.* London, 1870.      *Prehistoric Times.* London, 1865.

<sup>2</sup> *Researches into the Early History of Mankind.* London, 1865.

<sup>3</sup> *Ancient Stone Implements, etc.* London, 1872.

<sup>4</sup> *Prehistoric Man.* London, 2 vols., 1862.

<sup>5</sup> *Giant Mounds.* London, 1870.

Brittany ; and that lake dwellings, such as those to which in Europe we ascribe a very remote antiquity, are still the ordinary habitations of the Dyaks in the far east, and of certain tribes in Central Africa. We are entirely ignorant whether these modes of construction have descended continuously through the long vista of ages, or whether they are simply the result of special circumstances operating on the human mind in a certain stage of development. There is one department, however, in which this difficulty does not occur. Language has been in all ages a property of human beings. It is the connecting link between the present occupiers of this sublunary sphere, with all the accumulated wealth of untold ages, and the feeble savages who waged a not unequal war in the struggle for existence with the wild animals around. However diversified the various spoken dialects may be, there is no break of continuity. They can be traced backwards from children to parents, until they are lost in the night of antiquity. No new language has ever been invented in the history of mankind. We may, therefore, expect to find, imbedded in the innumerable languages existing in the world, indications beyond what are met with elsewhere of the general mind of humanity, as modified by outward circumstances and inward development; relics of archaic thought, feeling, and institutions; various modes adopted of attaining the same end of intelligibility by diverse means ; and thus we may ultimately arrive at the primitive germs of thought expressing themselves in articulate speech.

Viewed in this aspect, philology has become a legitimate department of mental science. It has of late years made prodigious advances, and though not pursued in this country with the ardour which it might fairly claim, in other countries, and especially in Germany, it has engaged the attention and exercised the powers of some of the keenest intellects of modern times. No study has thrown so much light on the

early condition of the human race, and none promises in the future a richer harvest to reward the patient explorer.

I ask you, on the present occasion, to accompany me over a somewhat extended enquiry, whilst we take a general view of the present state of linguistic science. The field is so vast that all we can do within so limited a space is to take note of the salient points.

As a science, philology is of very recent date. The knowledge of languages, other than their own, possessed by the ancient Greeks and Romans, was very imperfect. To the Greeks, in every age from the time of Homer, those who did not speak the Hellenic tongue were *βάρβαροι*, babblers.

The subject of language was not neglected by the Greek philosophers. Plato, in his *Sophistes*, has treated on grammar and syntax; and in the *Cratylus* he has gone into the question of roots and derivations. It has been surmised that some of the speculations in the latter were intended rather in jest, bearing sarcastic references to the rhetoricians of his day.<sup>6</sup>

Aristotle has written largely on the philosophy of language, and other Greek writers followed in his track.

Amongst the Romans, M. Terentius Varro, a contem-

<sup>6</sup> I have relegated to a footnote a few extracts from the *Cratylus*, as showing Plato's method of approaching the subject.

As to the connexion of languages, he says:—"If we consider foreign names, what each means is not the less discovered. I think that the Greeks, especially such as dwelt under the Barbarians, received many of their names from the Barbarians."

He seems to favour the onomatopeian or ding-dong theory of the origin of language. "Names belong to things from nature; every one is not the artificer of names, but he alone who looks to that name which is naturally suited to each thing, and who is able to mould its form into letters and syllables." "If any one is able to imitate this very thing, the existence of each thing by letters and syllables, would he not indicate what each thing is?"

The element of *ρ* appeared to the founder of names to be a beautiful instrument of motion for the purpose of expressing a similitude to rushing on. Thus *ρεῖν*, to flow; *ρένη*, flowing; *ρέμας*, trembling, etc. The letter *λ* is applied to the smooth and soft,' etc.

porary of Cicero, wrote a treatise, *De Lingua Latina*, in which he compares the various languages spoken in Italy.

During the middle ages, previous to the revival of learning in the fifteenth and sixteenth centuries, philology, in our sense of the term, can hardly be said to have had any existence. Scholarship, meaning by this the critical study of the Greek and Latin languages, and the careful editing of the works of the classical writers, then began to flourish, and a succession of great names, such as those of George Buchanan, Isaac Casaubon, Joseph Justus Scaliger, and our own Bentley, formed a catena extending to the beginning of last century. Biblical scholarship has always more or less flourished, from the times of Origen and Jerome to the present day.

In the early part of the eighteenth century, a new school of classical philology, of a more searching and thorough character, arose in Germany, commenced by Franz Wolfgang Reiz, and continued by Hermann, Wolf, Schleiermacher, and K.O. Müller.

This school, however, advanced upon the old lines. Grammar, lexicography, criticism, and mythology were pursued with ardour and earnestness; but the connexion of languages, the family relations, the indications of community, the converging lines were entirely unknown. Comparative philology, as a study and science, extends very little backward from the beginning of the present century.

The labours of the lexicographers of the two last centuries are worthy of all commendation. The dictionaries of Wachter<sup>7</sup> and Schilter,<sup>8</sup> for High German; Ihre,<sup>9</sup> for Norse; Ménage,<sup>10</sup> for French; Forcellini,<sup>11</sup> for Latin; Min-

<sup>7</sup> *Glossarium Germanicum*. Fol., Lipsie, 1787.

<sup>8</sup> *Glossarium ad Scriptores Linguae Franciae et Alemannicae*. 8 vols., fol., Ulm., 1728.

<sup>9</sup> *Glossarium Sniogothicum*. Fol., Upsala, 1769.

<sup>10</sup> *Dictionnaire Etymologique*. 2 vols., fol., Paris, 1750.

<sup>11</sup> *Totius Latinitatis Lexicon*. 4 vols., fol.. Paris, 1771.

sheu,<sup>13</sup> Skinner,<sup>13</sup> and Junius,<sup>14</sup> for English; in patient industry and extensive scholarship cannot be excelled; but the true key to the comparative study of languages had yet to be discovered, and much of their labour was expended in beating the air. Hebrew was considered the primæval language of mankind, Greek and Latin as in some way connected with it, and all other languages mere corruptions. Leibnitz was the first to question this unreasoning generalisation, and made an attempt to classify the languages of the world into families; but the time was not ripe, and the philosopher's attention was called off to other pursuits. It began to be felt that there was a connexion between the languages of the various members of the European family, but its nature and relations were entirely unknown. Vague conjectures and guesses supplied the place of more accurate knowledge.

It was the introduction, it might almost be said the discovery, of Sanskrit which furnished the key to solve these difficulties, and gave a new point of departure to comparative philology. It is to the efforts of Christian missionaries that we are mainly indebted for this new phase of enquiry. Hervas, a Spanish Jesuit missionary, was the first to point out the necessity of comparing languages, in their grammar and construction, as well as in mere similarity of sound. He showed the existence of the Semitic languages as a class apart, and discovered traces of affinity between the various European members of the Turanian family. Fra Paolino di San Bartolomeo, a Carmelite missionary, published at Rome, in 1790, the first Sanskrit grammar.

The progress of English ascendancy in the East gave a great impulse to the study of oriental tongues. Sir William Jones, judge of the Supreme Court in Bengal, and, after

<sup>13</sup> *Ductor in Linguas*. Fol., London, 1627.

<sup>13</sup> *Etymologicon Linguae Anglicanae*. Fol., London, 1671.

<sup>14</sup> *Etymologicum Anglicanum*. Fol., Oxford, 1748.

him, Henry Colebrooke, did much to introduce the knowledge of Sanskrit, and of its affinities with the European tongues. William Carey and his fellow missionaries at Serampore were amongst the first thoroughly to master the difficulties of the study.

In 1806, J. C. Adelung published his *Mithridates*,<sup>15</sup> being a general comparative view of the languages of the world, which, though necessarily imperfect, did much to call attention to the study of philology. From that time forward, the science has progressed with ever-increasing interest and success. In our own country, the names of Wilkins, Kennedy, Wilson, Pritchard, Max Müller, Monier Williams, Kemble, Sayce, Cleasby, and Rawlinson stand out with prominence, but Germany, in the number and profundity of philological works, far excels us. The names of the writers are almost numberless, and ever-increasing. Some of the most eminent are Franz Bopp, Aug. Fried. Pott, Jacob Grimm, Gabelenz and Lœbe, Theodore Benfey, Aug. Fick, H. Meidinger, Caspar Zeuss, etc.

France has not entered into the study with the same ardour, but it is to two French scholars, Anquetil du Perron and Eugéne Burnouf, that we owe our knowledge of the Zend or ancient Persian; and Professor Adolphe Pictet is the author of several elaborate works on the Indo-European languages.

The last half century has done more for comparative philology than all the ages preceding, and it is natural to inquire what has been the result. Where do we find ourselves? What light has been thrown on the history and origin of language, and on the relations and early development of the human race? These questions I will endeavour to answer as fully as my narrow limits will enable me to do.

In every pursuit which claims to be dignified with the

<sup>15</sup> *Mithridates, oder Allgemeine Sprachenkunde.* 5 vols., Berlin, 1806.

name of a science there are three stages of growth. First there is the collection of facts. Then come the generalisation and correlation of the facts, and the discovery of the laws governing these relations; and lastly the ultimate deductions to which we are led as the result of the analytical process adopted. As to the first stage in linguistic science, a large amount of facts has been collected. It has been established that the majority of the languages of Europe, and a number of those of Asia, are connected by family ties which unmistakably point to a common origin. These languages have been further classified into groups, the members of which have relations within themselves of a closer character than those uniting the groups. These are the Classical, comprising the Zend, Sanskrit, Greek, and Latin, and their modern descendants; the Teutonic, consisting of the High and Low German dialects, and the Norse; the Celtic, with its six divisions of Gaelic, Cymric, Cornish, Bas-breton, Pictish and Manx; and the Slavonic group, comprising the Russian, Polish, Lithuanian, Wendish, &c. Indications of a common origin are found in the vocabulary and the structure, and it is here that the evidences of law first begin to manifest themselves. The words in one group are not identified with those in another by exact similarity in sound, but by a substitution according to a regular and definite rule, which, from the name of Jacob Grimm, who first discovered it, is called "Grimm's law." I may exemplify this by an instance or two. In Greek, *τρες*, in Latin *tres*, is the third of the numerals. That they have a common origin in all the Indo-European languages is indubitable, but we must not look for identity. In the Low German group the medial *d* is represented by the aspirate *th*, and *tres* becomes *threis*, or *three*. In the High German the *t* or *th* is exchanged for a medial or soft con-

sonant, and it becomes *drei*. So with other consonants. *Bhratar* in Sanskrit, *Frater* in Latin, becomes *brothar* in Low German, *prudar* in Old High German. These changes or equivalents are so uniform as to constitute a law, so that words in the different languages are identified, not by their likeness but by their differences, which may be predicted beforehand, according to certain rules. Thus if we take our English word *cow*, and wish to trace it through the kindred groups, we shall expect to find it with a medial or *g* in Sanskrit, and an aspirate in Old High German. Accordingly we meet with *gau* or *go* in the former, and *chua* in the latter, with the same signification. On this feature I cannot enlarge.

The relations of the great Indo-European family may be thus illustrated. Let us imagine a number of lines not parallel, but more or less converging, though broken, entangled and distorted, some stopping short, others prolonged. These appear at first sight incommensurable and impossible to reduce to system, but by patient skill it is found possible to ascertain their direction, and to find the common centre to which they all tend. This has been done with great success by some of our modern philologists. Professor Fick, of Göttingen, has thus brought out the elements of the original Aryan speech in a very interesting way.<sup>16</sup>

Another mode of inquiry somewhat resembles the method adopted by Sir Wm. Herschell, in gauging the starry deeps. By directing his telescope towards successive portions of the surrounding stellar system, and noting down the comparative number of stars in each observation, he was able to construct a map or model of the shape of the group to which our solar system belongs. Now, if we compare the various

<sup>16</sup> *Die ehemalige Sprachenheit*.—Göttingen, 1873. *Vergleichendes Wörterbuch der Indogermanischen Sprachen*. 8 vols., Göttingen, 1874.

languages belonging to the Aryan family, we shall find some words peculiar to a single group, or even a single language. Others are common to several, and a limited number are found in all. It is clear that those words which are found in every language of the family, or even in one language of every group, must have existed before the separation of the primeval stock. This would throw considerable light on the primitive condition of the race at the remote period before the migration from its original habitat, and the words peculiar to each group would equally illustrate the particular circumstances under which they originated. This task has been partially undertaken by Professor Adolphe Pictet<sup>17</sup> with considerable success. A single example may suffice to illustrate my meaning.

The primitive root *ar* is found in all the Indo-European languages. From the primary meaning to push, it was applied to ploughing the soil, and appears in Greek *ἀρούνειν*, Latin *ar-are*, Goth. *ar-jan*, Gaelic *ar*, A.S. *er-ian*, etc., and many other words in almost every dialect. When the nomadic tribes began to cultivate the ground, and adopt a settled life, the term *arya*, or ploughman, became an honourable distinction, and gave its name to the upper class, or nobility. Aryan thus became adopted as a generic term, which has been applied to the people and languages of Indo-European origin.

There is, however, another word for turning up the earth, which in all the northern parts of Europe has superseded the original term *ar*; German *pflügen*, Norse *plogr*, Slavonic *plug-u*, English *plough*. How this came about is a curious subject of inquiry. The date of its introduction is not known, but it is confined to the Teutonic and Slavonic races. In Gothic it is unknown; in the Norse tongues it is of late

<sup>17</sup> *Les Origines Indo-Européennes ou les Aryas Primitifs.* 2 vols., Paris, 1863.

introduction, and we do not find it in our own language before the Conquest. Its history appears to be as follows :—

The original Roman *aratum*, which is still in use in Italy and all the southern countries, was merely employed to scratch a furrow in the ground, which in that fertile soil and climate served all the purpose. The sterile soil and harsher climate of the north led to the adoption of a more powerful instrument, which not only scratched, but turned over the soil. To this was given the name of H.G. *pfluoch*, from a root signifying to turn over, to work deep. This is one instance of the curious historical information which may be drawn from comparative philology.

We find then established, as an ascertained fact, the common origin and solidarity of the Aryan or Indo-European tongues. A collateral fact of equal importance is the essentially inflectional character of all these languages. By inflectional, is meant a structure which expresses its various shades of meaning by changes in the words themselves; prefixes, suffixes, and internal changes. In many modern representatives of the Aryan stock, and notably in our own language, this inflectional character has almost disappeared, but the further back we go the more decided does this feature become, and the more do these inflections, in each language, resemble each other. The Latin language, and, to a greater extent, the Greek, exhibit this character well developed, but it is in Sanskrit, the eldest sister, as it may be called, of the Aryan family, that the inflectional system is the most fully carried out. I wish to illustrate, as briefly as I can, the structure of an inflectional language, by reference to the Sanskrit.

Sanskrit grammar starts from roots. Of the origin and scientific nature of these I shall have to speak shortly. According to Max Müller, a root or radical is “whatever in

the words of any language, or family of languages, cannot be reduced to a simpler or more original form." It is a singular fact, account for it as we may, that the great majority of the roots in Sanskrit are expressive of general or abstract ideas. Thus, *gam* gives the idea of going, *sthā* of stability, *rad* of speaking, *da* of giving, etc. Sanskrit grammarians have estimated the number of radicals from which all the words in the language are derived, at about 1,700; but the simple elements to which a further analysis conducts us reduces the original number to less than 600. In the actual state of the language, the 1,700 dictionary roots are the vital principles out of which grows all the complicated plethora of words of one of the most copious languages existing. These roots, before they are fitted to receive the distinctive affixes, frequently have to undergo certain changes, to which it is not necessary here to refer.

Each verbal root is the base of six kinds of verbs, transitive, reflective, passive, causal, desiderative or optative, and frequentative or intensive. There are ten tenses in each, with three numbers and three persons. In addition to these there are the participles and infinitives. All of these are expressed by changes grafted on the root. Each verbal root, therefore, will give rise to about 679 separate inflections, including the declensions of the participles. Let us glance, for a moment, at the simple means by which this is effected. There are ten classes or conjugations, distinguished by the mode of forming the base from the root. We will take our instance from the first-class. The root *rāj*, has its equivalent in all the Aryan tongues, Latin *reg*, Greek *ἄρχειν*, Ger. *reich*, A.S. *ric*, Norse *rik-r*. Its primitive meaning is that of shining, distinguished, hence that of ruling. To adapt it to the form of a verb, the vowel *a* is added, giving the idea of movement. To this base so

formed, the pronominal suffixes of person and number are attached, *rajá-mi*, *rajá-si*, *rajá-ti*, I rule, thou rulest, etc. Some of the tenses have the augment *a*, corresponding to the Greek augment in *e*. The perfect tenses have a reduplicated form, *rarája*, such as originally existed in almost every Aryan tongue, Greek τυπτω, τετυφα, Latin *mordeo*, *momordi*, Goth. *tekan*, *taitok*. So *rajitasmi*, I will rule, equivalent to Latin *regam*; *rajayámi*, I cause to rule, *rajáyásam*, I wish I may rule; *raje*, I am ruled; *rarajishami*, I desire to rule; *rarajyami*, I frequently rule; *rarajayishámi*, I desire to cause to rule; and so on.

There can be no question that we have documents in Sanskrit older than those in any other Aryan tongue, and all evidence goes to show that this family of language, in its early stages, and during a long period of its history, has been essentially inflectional.

Besides this comes another family, with its records the most ancient in the world — the Semitic, comprising the Hebrew, Arabic, Phœnician, Amharic, and other ancient tongues long extinct. These possess a certain inflectional character, though comparatively imperfect. Whether there is any connexion between this and the Aryan family, is a moot point on which philologers are not agreed. There lie on the surface certain analogies of form, if not of substance, which cannot be overlooked on the most superficial survey. The structure of both is developed from roots, principally verbal; in the one case trilateral, depending entirely on the consonants; in the other monosyllabic, depending greatly on the vowels. The verbal inflexions in both are derived from pronominal forms, so far broken down as to have become mere enclitics. Compare, for instance, two verbs taken almost at random, one from the Sanskrit, the eldest sister of the Aryan family; the other from Hebrew, as representing the Semitic forms.

SANS.	HEBREW.
Root कृ च् Kach, to bind.	Root קָשַׁר Káshar, he bound.
<i>Present Indicative Parasmai.</i>	<i>Kal Conjugation.</i>
Kach-a-mi, I bind.	Káshar-ti, I bound,
Kach-a-si, thou bindest.	Káshar-tá, thou didst bind, <i>mas.</i>
Kach-a-ti, he binds.	Káshar-t, <i>fem.</i>
	Káshar <i>he bound,</i> <i>mas.</i>
	Káshar-ah, <i>fem.</i>
<i>Plural.</i>	<i>Plural.</i>
Kach-a-mas, we bind.	Káshar-nu, we bound.
Kach-a-tha, ye bind.	Káshar-tem, ye bound, <i>mas.</i>
Kach-a-nti, they bind.	Káshar-ten, <i>fem.</i>
	Káshar-u, <i>they bound.</i>

There is here, saying nothing of the similarity of the roots, which may possibly be fortuitous, a strong analogy in the inflectional principle adopted.<sup>18</sup>

The assumption has too much prevailed that all the problems of the science of language will find their solution in the study of the Aryan tongues. This was the snare into which the earlier philologists fell, and from which the students of language are now only beginning to emerge.

We have then before us, as established facts, the original unity of the Aryan or Indo-European family of languages, and their inflectional character. Were our observations limited to these facts, it would not be difficult to frame a plausible hypothesis as to the origin and progress of human speech; but other indications have to be taken into account, of a widely different nature.

There are various methods of communicating thought; signs, gestures, tones, as well as articulate speech, and the

<sup>18</sup> "The Semitic family is at once too small and too compact; its branches do not differ more among themselves than do the Romance languages in Europe; and until its Sanskrit has been found, as it may be in the old Egyptian or the Sub-Semitic idioms of Africa, we cannot get beyond a parent speech which is philologically late, and which fails to offer that facility for comparison which is needed by the young glottologist."—Sayce, *Principles of Comparative Philology*, p. 70.

latter has frequently to be eked out and supplemented by the former. The mind has a wonderful aptitude in supplying the missing links when the main points of a communication are presented. We see this in the language of childhood. Who could mistake the expression of a tired child, "Mamma—up!" or the yielding to authority, after a tempest of infantile wrath, in the single words, "Papa—good." There are existing languages in which the same syllable stands for far different meanings, according to the tone in which it is uttered. Thus, in the Annamitic language, the syllable *ba* has a variety of significations, according to the mode in which it is pronounced. With no accent or tone it means *three*; with the grave accent it means a lady; with the acute accent it means a favourite of a prince; with the interrogative tone it means a box on the ear.<sup>19</sup>

*Ba, bà, bā, ba?* therefore means, if properly pronounced, "three ladies (gave) the prince's favourite a box on the ear."

Now this monosyllabic mode of speech constitutes the language of nearly one-half of the human race, including the teeming millions of China, Cochin-China, Thibet, Burmah, Siam, and Cambodia. Forming such a very important element in any comparative analysis of human speech, a brief synopsis of Chinese grammar may not be out of place. A great deal of absurdity has been written about the Chinese language. It has been gravely maintained that the spoken and written languages are entirely independent of each other, Chinese writing, like the Arabic numerals, being ideographic, conveying the same meaning to persons speaking dialects entirely different. The slightest consideration will show the utter impossibility of such a state of things, the accomplishment of which would necessitate a conference of persons phonetically conversant with all the languages, to agree upon a code, something in the same way as Marryat's marine signals

<sup>19</sup> Max Müller, *Lectures*, 2nd ser., p. 80.

giving a symbol for every shade and combination of thought which could cross the human mind. The mere statement of such a proposition is sufficient to show its absurdity.

It is true that some utterances of the writers on the Chinese language appear to give countenance to this idea. Morrison<sup>20</sup> says, "They have no alphabet. The character presents nothing to the eye by which its pronunciation can be ascertained. It attempts to communicate the meaning, regardless of the sound." Dr. Marshman<sup>21</sup> says, "The sound of no character is inherent therein; it may be totally changed without affecting the meaning of the character." These statements are strangely at variance with others elsewhere made by the same writers. Dr. Marshman says,<sup>22</sup> "Speech must necessarily precede writing, and some colloquial mode of communication must have preceded the invention of the Chinese characters."

"If, when the Chinese invented the characters, they did not affix to them the sounds with which they had already connected ideas, of what service could these characters be when invented? New sounds could convey no ideas till these sounds were universally recognised as connected with ideas; and, in order to affect this, a nation must agree to throw aside the sounds with which alone they had hitherto connected ideas, and in reality invent for themselves a new language—a circumstance unparalleled in the history of mankind. We have therefore no sufficient ground to conclude that any colloquial medium widely different from the present has at any time existed in China; but, on the contrary, the probability is that the present system existed in substance prior to the invention of the characters."<sup>23</sup>

No fewer than six Chinese pronouncing dictionaries have been published by Imperial authority; the first A.C. 150, and

<sup>20</sup> *A Grammar of the Chinese Language.* Serampore, 1815, p. 1.

<sup>21</sup> *Elements of Chinese Grammar.* Serampore, 1814, p. 81.

<sup>22</sup> *Ibid.*, p. 82.

<sup>23</sup> *Ibid.*, p. 88.

the last at the beginning of the eighteenth century. As the seat of government had been removed in the intervals of each publication, the phonetics of the characters have varied with the pronunciation of the provinces from whence the dictionaries have been issued. Here, in fact, lies the solution of the whole mystery. If we could imagine, in our own language, the same written characters employed, and at the same time the dialectic differences increased tenfold, being in proportion to the population of each country, we may form some notion of the relation of the spoken to the written language in China. This difference has been increased also by other circumstances. Although Chinese has no alphabet or letters, each character standing for a syllable, yet there are what are called initial<sup>24</sup> and final sounds<sup>25</sup> applied to the pronunciation, which are practically equivalent to vowels and consonants. It is a remarkable fact that these sounds, so far as they go, are identical with the Sanskrit letters. The combination of these initials and finals, omitting duplicates, gives 629 distinct monosyllables. These, again, are varied in their expression and meaning by the tones in utterance, of which there are four. This should produce about 2,500 distinct intonations, but as a matter of fact there are only 1,781. "The Chinese, ignorant of the polysyllabic system, and unable to form a conception of any sound beyond those produced, as already described, were ready enough to apply a new character to a new idea; but to express such new character they fell back upon sounds already existing. The same sound thus frequently applies to characters of entirely different meaning, which has to be supplemented by gesture relation to the subject, and position."

"A Chinese character may consist of two parts; a radical, which conveys a fundamental notion, and a phonetic, which indicates the sound. This is not, however, constantly the

<sup>24</sup> *Tse-moo*, mother sounds.

<sup>25</sup> *Nysh*, auxiliary sounds.

case. The compound character which extends the meaning of the radical may have a different sound from either of the component parts. The number of characters is upwards of 40,000, but a large proportion are obsolete, and many are merely variations not in use. Not more than 10,000 enter into use, and 5,000 are quite sufficient for ordinary purposes.<sup>26</sup> . . . . The expression of such a large number of ideas by a limited number of sounds must necessarily lead to confusion. In writing, the sense is clear enough; but in speaking, the sense has to be gathered by the cohesion, intonation, emphasis, and position, which produces the same effect as if the language were polysyllabic; the difference being that every syllable has a meaning."<sup>27</sup>

The Chinese system of writing has many points in common with the Egyptian hieroglyphics. Both are phonetic. In Chinese the whole, and in Egyptian the greater part, of the signs stand for syllables or words. In both the medial sounds, *b*, *g*, *d*, and *z*, are wanting. In both there is no distinction between *l* and *r*. In both signs are added to eke out the original meaning of the symbol.<sup>28</sup>

We have, then, in Chinese the type of a monosyllabic language without inflections. Every syllable or sound has a meaning, which is modified by its position in the sentence, and expressed by the tone in which it is pronounced. In this way every minute shade of meaning finds expression equally with the most complicated inflectional language. Gender, case, the various tenses of verbs, comparatives, superlatives, etc., are all indicated by superadded characters.

There must always in this mode of expression be somewhat of an elliptical character; *e.g.*, the sentence, "If the

<sup>26</sup> Summers, *Hudiments of the Chinese Language*, 1864.

<sup>27</sup> *Ibid.*, p. 8.

<sup>28</sup> See Renouf, *Elementary Grammar of the Ancient Egyptian Language*.

disciple be at home, filial piety then becomes his business; if he be abroad, fraternal respect," is thus expressed.

"Teé tsü yéh , tsǖ hyaò ; tchyǖ tsǖ  
The disciple entering, then filial duty; without, then  
teè.  
fraternal respect.

Perhaps of all living languages the English lends itself the most readily to this mode of construction. There is much in common between the English and Chinese. In the one the entire, in the other the almost entire absence of inflection; in both, the same word may be employed without change either as a substantive, adjective, or verb, which is peculiar to the English amongst European tongues.

Take *love* as a verb : "I *love* them that *love* me;" as a substantive : "*love* is the brightest of the train;" as an adjective : "I have received a *love*-letter," etc. English also resembles the Chinese in the great number of monosyllables in the language.

It is probably this similarity which has facilitated the formation of the jargon called "Pigeon English," which is the medium of communication at Canton and the other ports. It is simply English words and Chinese construction, with the introduction of a few Chinese terms. As the Chinese do not possess the sounds of *b*, *g* hard, and *d*; *l* being the substitute for *r*, and *s* being pronounced with difficulty, *pigeon* is the nearest approach of John Chinaman to the word *business*.

The following is a specimen, being a letter of introduction to a Chinese merchant, given by an English friend :—

"Mi chin chin you ; this one velly good fin belong mi, mi wantchee you do plopel pigeon long he all same fashion long mi ; spose no do plopel pigeon, mi fin cum downside mi housie, talkee mi so fashion ; mi kick up bobbery long you."

This is the reply :—“ Mi savey no casion makery flaid ; can secure do plopel pigeon long you fin, all same fashion long you.”<sup>29</sup> This is perfectly intelligible, and true Chinese construction.

We have then in our speculations on language to take into account the fact of a system diametrically opposite to the Aryan, and claiming an equal position as an independent member of the human family.

We come now to another great division in the families of human speech, what is called for convenience the Turanian family. This term is of Persian origin. The Persians called their own country *Irán*, which is only another modification of *Aryan*. The nomadic races of the wide Asiatic plains, with whom they frequently came into collision, they called *Turan*, from a word signifying “ swiftness.”

This class of languages is termed the agglutinative or combinatory, holding a middle place between the Aryan or inflectional, and the monosyllabic or non-inflectional. In these tongues the meaning of words is modified by suffixes, but these suffixes have not lost their meanings. They are not mere auxiliaries or enclitics, useless apart from the words to which they are attached. The grammar of the language, therefore, is simply the mode in which its independent elements are combined together. Thus, in the Turkish language, *sevmek* means to love, *sevmemek* not to love, *sevdirmek* to cause to love, *sevilmek* to be loved, *sevinmek* to love oneself, to rejoice, *sevinchmemek* not to be able to rejoice, *sevishmek* to love mutually, *sevishéhmemek* not to be able to love mutually, and so on. It will be perceived that this process does not differ materially from the mode of building up the Sanskrit verb ; but with this difference, that the component parts which in Sanskrit have lost their meaning

<sup>29</sup> Dr. Daniel Wilson, *Prehistoric Man*, vol. i., p. 428.

except in the combinations they form, in the Turanian languages are living independent words. The language thus developed becomes eminently polysyllabic.<sup>so</sup>

Mr. Edkins<sup>si</sup> says:—"The dividing line is a sharp one, which the traveller crosses from the region of tone systems, and carefully pronounced inflexions of the voice, to the freedom of polysyllabic speech. He suddenly finds himself where tonic laws have been thrown away, and all accented and inflected elocution has been transferred from the region of the syllabary and the vocabulary to that of the passions and the will. It is but a short distance from the Chinese city to the Mongol encampment, but the change is great."

At the height of 2,000 feet commences the table land, which has received the name of the "land of grass." Pastoral occupations take the place of field labour, and a limitless horizon is only varied by the undulations of the vast prairie. It is in these boundless plains, amongst the roving Tartar and Scythian, that the Turanian family of languages had their birthplace. The field over which these languages prevail is very wide, extending from the extreme east of Asia to the centre of Europe. The Japanese forms the eastern division. In the north, we find Mongols, Manchus, and other Tartar tribes, with the Tungusians and Samoyedes. The southern division occupies the Deccan and a considerable portion of India, constituting what are called the Dravidian languages, the Tamil, Telugu, Malay, etc. The western division consists of the Turkish, Hungarian, Estonian, Finnic, Lapp, and probably the Basque.

The three grand divisions of which I have spoken were, until recently, supposed to include every variety of human speech:—

The monosyllabic, in which inflection is unknown.

<sup>so</sup> See Burckhardt Barker, *Turkish Grammar*, 1854.

<sup>si</sup> *China's Place in Philology*, 1871, p. 139.

The agglutinative, in which expression depends on the combination of monosyllabic words.

The inflectional, in which the root-words branch out into every shade of meaning by the annexation of particles and affixes.

This, however, has of late years begun to be very seriously questioned. The languages of Europe and Asia have been very carefully studied and classified, but, in the words of Scripture, "there remaineth yet very much land to be possessed." The facility of intercourse has brought under our notice a multiplicity of languages in Africa, America, and Polynesia, differing in almost every point of view, and refusing to be classified with those already known. The hypotheses, founded solely upon the facts previously established, may therefore have to be very extensively modified. A new school of philology has arisen, which oversteps the ancient landmarks, and questions the principles which have to a great extent been accepted as irrefragable truths.

In the progress of every science there is always a tendency for generalisations and hypotheses to overrun the facts on which they are based. This is inevitable, and has to be corrected from time to time as knowledge advances.

The threefold classification to which I have just referred owes its origin to the Chevalier Bunsen<sup>22</sup> and Professor Max Müller.<sup>23</sup> It is supported by Professor Whitney,<sup>24</sup> and has received very general acceptance. Latterly, it has been seriously called in question by the most advanced school of philologists. M. Ernest Rénan observes :—

"L'hypothèse d'une famille *touranienne*, par laquelle on cherche à établir un lien de parenté entre des langues entièrement diverses, nous paraît gratuite, et formée par des

<sup>22</sup> *Outlines of the Philosophy of Universal History*. London, 1854.

<sup>23</sup> *Lectures on the Science of Language*, 1st ser., p. 276.

<sup>24</sup> *Language, and the Study of Language*, 1867, p. 860.

procédés qui ne sont pas ceux de la science rigoureuse." "Ainsi en a jugé également un esprit à la fois sévère et hardi, M. Pott,"<sup>55</sup> qui en rendant pleine justice aux vues ingénieuses que le savant M. Müller a semées dans son ouvrage, le juge pour l'ensemble peu conforme aux vrais principes de la philologie comparée, et capable d'égarer une étude déjà entourée de tant de périls."<sup>56</sup>

Mr. Sayce writes :—"It is implied in the ordinary classification that families of speech analogous to the Aryan are to be found all the world over. Every idiom, ancient or modern, has to be brought, willing-nilling, under some 'family'; the admission that a language may be *sui generis* is never even dreamt of. We have even had a 'Turanian family' invented, into which everything that is not Aryan or Semitic has been thrust, from Turkish and Tamulian to Chinese and Red Indian."....."Now that the term 'Turanian' is more properly confined to a chain of certain dialects, a new family has been brought into existence, to be called agglutinative, or allophyllian, or heaven knows what."<sup>57</sup>

It is quite certain that the old classification can no longer be maintained. The multiplicity of African and American languages, brought to light by recent research, many of them of the most complicated character,<sup>58</sup> refuse to be dealt with in this Procrustean fashion, and the time is not yet arrived for the foundation of a true theory embracing all the phenomena.

Another moot point, on which an irreconcilable difference exists, is as to the nature of roots. All languages

<sup>55</sup> *Zeitschrift der Deutschen Morganländischen Gesellschaft*, 1855.

<sup>56</sup> *De l'Origine du Langage*, Paris, 1864, pp. 41-43.

<sup>57</sup> *Principles of Comparative Philology*, 2nd ed., 1875, p. 100.

<sup>58</sup> "Les langues des sauvages de l'Amérique, celles des habitants de l'Afrique centrale et méridionale, qui commencent à fournir à la science des révélations inattendues, offrent une richesse grammaticale vraiment surprenante."—Renan, *ut sup.*, p. 18.

must have had some rudimentary form, and it is the most natural idea that the simple should precede the complex, and that the abstract should grow out of the concrete.

Roots have been considered as the primitive elements out of which language has been formed. Max Müller says:—

“After explaining everything in the growth of language that can be explained, there remains in the end, as the only inexplicable residuum, what we call roots. These roots form the constituent elements of all languages. This discovery has simplified the problem of the origin of language immensely. What, then, are these roots? In our modern languages, roots can only be discovered by scientific analysis; and, even as far back as Sanskrit, we may say that no root was ever used as a noun, or as a verb. But originally roots were thus used, and in Chinese we have them preserved to us as a representative of the primitive radical stage.”<sup>39</sup> “A root is always monosyllabic. Roots consisting of more than one syllable can always be proved to be derivative roots.”<sup>40</sup>

To the theory thus stated several objections have been started. If it be true, according to Locke, that there is “nihil in mente quod non prius in sensu,” we should expect to find the radical elements of an inflectional language consisting of concrete ideas—names of things; but the reverse of this is the fact. As stated by Mr. Sayce:—

“Roots, in the lexical or grammatical sense of the term, are those ultimate phonetic elements discovered by an analysis of groups of allied words, and they stand in the same relation to words as letters and syllables do to them.”<sup>41</sup>

In the eldest sister of the Aryan family, the Sanskrit, where alone we can look for true roots, they are nearly

<sup>39</sup> *Lectures*, 1st ser., p. 342.

<sup>40</sup> *Ibid.* p. 249.

<sup>41</sup> *Principles of Comp. Philology*, pref. vi.

all abstract or general terms. Thus *gam* and *sthá* do not signify to go, and to stand, but the general idea of movement and stability, and have to be modified in their application as nouns and verbs. In this sense the Chinese primitives are not roots, but actual words, which are employed in ordinary speech and writing, and are modified by accretions, position, and tones.

"We know that with certain exceptions, about which there can be little controversy, all our words are derived from roots, and that every one of these roots is derived from a general concept. 'Without roots no languages, without concepts no roots.' These are the two pillars on which our philosophy of language stands, and with which it falls."<sup>42</sup>

Out of the twenty-six letters of the English alphabet all our words are formed; but we know that the letters did not exist previously to the words, but are arrived at by the ultimate analysis of the sounds issuing from the lips. So the roots in the Aryan tongues are only discovered by a laborious elimination of all the modifications of expression, until the central idea is reached. This, when found, is usually expressed by a monosyllable, but we have no ground whatever for maintaining that this was the mode in which language originated. Chinese is pointed to as an instance of the principle, but we have no more right to maintain that Chinese has been always monosyllabic than that the Aryan branch has been always polysyllabic. The tendency in all languages, so far as experience goes, is from the synthetic to the analytic, and never in a contrary direction.

If the principle of monosyllabic roots is to be maintained, probably the most complete theory is that of Dr. Alexander Murray, Professor of Oriental Languages in the University of Edinburgh, who, in his learned work, the *History of the*

<sup>42</sup> Max Müller, *Chips*, vol. iv., p. 477.

*European Languages*,<sup>43</sup> seriously propounds "that all languages are founded on a single language, which originated out of nine words or syllables—Ag, Bag, Thwag, Gwag, Lag, Mag, Nag, Rag, Swag." These give the idea of action in its various forms. If the first difficulty be got over, the work is able, and the reasoning powerful, if not convincing.

A very similar view of the origin of radicals is given by Liancourt and Pincott, in their work entitled *Primitive and Universal Laws of Language*, 1874. They adopt the onomatop theory, and reduce the essence to single letters—G, I, L, P, T, etc.

Max Müller maintains,<sup>44</sup> and is supported by Professor Whitney,<sup>45</sup> that every inflectional language was once agglutinative, and every agglutinative language once monosyllabic. The necessity for this is denied by M. Renan and Mr. Sayce. It is argued that, if this were so, the change from one form to the other would indicate progress in civilisation and the arts, whereas, in point of fact, some of the rudest races in Central Africa, and the Esquimaux, possess languages in the highest degree synthetic and inflectional; whilst the Chinese, whose language is entirely monosyllabic, have attained a high degree of civilisation, and literature of a particular kind. It is further argued, that if the theory of the three stages were true, some historical evidence would be forthcoming in support of it; that at the remotest period to which our researches can extend, we should find the simple elements gradually crystallising into the synthetic form. In reality, the very reverse of this is the case. The further we go back in our inquiries, the more complex and synthetic does language become.<sup>46</sup>

<sup>43</sup> *History of the European Languages*. Edinburgh, 2 vols., 1823.

<sup>44</sup> *Lectures*, 1st ser., p. 317.

<sup>45</sup> *Language*, pp. 256-80.

<sup>46</sup> La marche des langues vers l'analyse correspond à la marche de l'esprit humain vers une réflexion de plus en plus claire; cette tendance commune de

The modern English is probably the most analytic in its structure of all the Aryan family of tongues. We claim for it a power, capacity, and precision second to none and superior to most. This claim has been admitted by some of the greatest masters of language. Jacob Grimm says of it:—“This English may truly be called a world language, and seems, like England herself, destined to rule over all the corners of the earth. In wealth, wisdom, and economy, none of the living languages can vie with it.” Yet, what do we find? The ultimate result of all this growth has been to give our language a greater approximation to the mono-syllabic non-inflectional Chinese than is possessed by any other tongue.

We pass from this to another disputed point. Are all languages derived from a single original, or has the source of each family been an independent creation? Has the progress of language moved in radiating or parallel lines? This question, although closely allied to that of the unity of the human race, is not necessarily identified with it. It is possible to conceive that, in its rudimentary condition, the genus *Homo* might have existed for a considerable period without articulate speech. In regard to this subject a great change has passed over the philosophic mind. It has always been difficult to separate this question from theology and revelation. Down to a recent period, it was a fixed axiom of the advanced school, that to deduce the origin of mankind from a single centre was an absurdity; but, since the theory of development has been so prominent, there has been a revulsion in the opposite direction. Mr. Sayce says:—“No utterance of science is clearer than this, that all which is

l'esprit humain et du langage a existé dès le premier jour; c'est donc au premier jour qu'il faut placer le plus haut degré de synthèse....Il est probable que dans le langage de l'homme primitif, ainsi que cela a lieu dans celui de l'enfant, l'expression de la pensée se produisait comme un ensemble, et sous la forme d'une riche complexité.”—Renan, *et seq.*, p. 12.

now in being is the result of evolution or development ; that, look where we will, to the most distant horizon of space, or the dimmest antiquity of time, there is no break, no void, nothing but an unvarying, unchangeable continuity of progress. Darwinism is the most fashionable hypothesis of our day, and Darwinism is supposed to imply a common type and a single pair of ancestors. But some, even of the most advanced supporters of the Darwinian theory, have themselves been obliged to resign the homogeneity of the human race, so far as origin is concerned.... We have all been cast in the same mould, or, as St. Paul puts it, we have all the same blood ; but it does not follow that we all come from the same ancestry, still less that all languages have radiated from the same centre.”<sup>47</sup>

Professor Max Müller is not very decided as to the single or plural origin of languages,<sup>48</sup> but leans to the former, in which he is supported by Mr. Whitney.<sup>49</sup>

Mr. Edkins is strongly in favour of a common origin,<sup>50</sup> to which Professor Legge assents in somewhat measured terms.<sup>51</sup> M. Renan is decided in the other direction.<sup>52</sup>

From this we are naturally led to the speculations on the origin of language, which have occupied men's minds from the time of Plato to the present day.

The idea long held was that language was a divine gift,

<sup>47</sup> *Principles, etc.*, p. 102.

<sup>48</sup> See *Lectures*, 1st ser., pp. 318-327.

<sup>49</sup> *Language*, pp. 384-397.

<sup>50</sup> *China's Place, &c.* Introduction.

<sup>51</sup> *Report on Chinese, &c.* See President's Address to *Philological Society*, 1875, p. 42.

<sup>52</sup> S'il est en effet, un résultat incontestable, c'est que le réseau des langues qui ont été ou sont encore parlées, sur la surface du globe, se divise en familles absolument irreductibles l'une à l'autre, . . . le langage n'a point une origine unique, il s'est produit parallèlement sur plusieurs points à la fois. Ces points ont pu être fort rapprochés ; les apparitions ont pu être presque simultanées ; mais certainement elles ont été distinctes et le principe de l'ancienne école, “Toutes les langues sont des dialectes d'une seule” doit être abandonné à jamais.—*De l'Origine du Langage*, p. 202.

that when man was created, the faculty of speech, along with reason, was conferred upon him, at least in its radical form, so far as to enable him to name the objects of sense, and to hold communion with his kind. This view, in modern times, has been almost entirely abandoned. The faculty is still conceded, but its exercise is admitted to be entirely of human origin.

Three theories have been propounded of the human origin of language, respectively termed the "bow-wow" or "ding-dong" theory; the "pooh-pooh"; and the "jelly fish" theory. Let us take them in order. The first draws the inference that primitive roots are imitations of natural sounds, whether animate or inanimate. The voices of birds, the lowing of cattle, the moaning of the sea, the crash of the falling forest, the rustling of the leaves, the hum of the bee, led to imitations in the human voice, and thence to articulate speech. Herder and Steinthal, in Germany, have been the chief exponents of this theory, which has been revived in England by Mr. Hensleigh Wedgwood, with great ability.<sup>ss</sup>

There can be no doubt that a number of words in every language have been formed on the principle of onomatopeia, or imitation of nature, but the proportion of these terms, in any language, is not large. To a certain extent this language, like that of signs, is intelligible in every idiom. We all remember the story of the Englishman, who, at the table of a Chinese mandarin, wishing to know the contents of a particular dish, exclaimed, in an interrogative tone, "Quack, quack?" The reply, in a grave tone of affirmation, was "Bow-wow." The objection to this theory is, that the basis is not broad enough to build a theory upon; that if the origin of language could be accounted for in this way, the principle would apply universally, and not spasmodically,

<sup>ss</sup> *A Dictionary of English Etymology.* 4 vols., 1869.

some sounds adopted in one language and others in another, and, as a matter of fact, the great bulk of language is not, and never was, onomatopeiotic.

The second theory is the interjectional one, viz., that there are natural sounds by which we express fear, pain, joy, excitement, or pleasure, and that these are capable of forming the basis of an articulate language.

The best reply to this is, perhaps, that of Horne Tooke, that the dominion of speech is erected on the downfall of interjections. Speech begins where interjections end. It would be difficult to find many mere cries of pain or pleasure which have been incorporated as parts of speech. These two theories failing, on what have we to fall back? We have already seen that all the phenomena point to a synthetical origin of language, that is, that the first utterances were rather comprehensive than discriminative. This view has been followed up by Mr. Sayce, in his able work on the *Principles of Comparative Philology*, already alluded to. The same idea had previously been broached by M. Renan, "Je persiste donc, après dix ans de nouvelles études à envisager le langage comme formé d'un seul coup et comme sorti instantanément du génie de chaque race. . . . Bien qu'arrivé peu à peu à la pleine évolution de toutes ses puissances, le langage fut intégralement constitué dès le premier jour; de même que dans le bouton de fleur, la fleur est tout entière avec ses parties essentielles, quoique ces parties soient loin d'avoir atteint leur complet épanouissement."<sup>54</sup>

Waitz also, in his *Anthropologie der Naturvölker*, published in 1858, has come to the same conclusion. He says "We do not think in words, but in sentences; hence we may assert that a living language consists of sentences, not of words. But a sentence is formed not of single independent

<sup>54</sup> Renan, *ut sup.*, p. 16.

words, but of words which refer to one another in a particular manner, like a corresponding thought, which does not consist of single independent ideas, but of such as, connected, form a whole, and determine one another mutually.”<sup>55</sup>

“ Nothing can be more intricate, more complex, than the grammar of the Red Indian, or of the Eskimaux. . . . Out of the manifold comes the simple, out of the multitudinous the single. . . . The meaning of words begins with a confused vagueness, out of which definite forms with definite significations are gradually evolved. Language is the expression of thought; and the first ideas were as much undifferentiated embryos as the jelly fish on the shore, or the bee-hive life of primeval man.” Hence the principle, so propounded, has had the name of the *jelly fish* theory attached to it. The idea is that the primary utterances, in the way of language, were confused attempts to express mental impressions and conceptions, which would be quite as frequently complex as simple; and just as the substance of the *jelly fish* possesses all the elements of organism in a plastic form, so the first attempts to embody thought in speech would be capable of analysis and adaptation, as conceptions grew clearer, and their application more specific.

Dr. Moffat, in his *Missionary Scenes in Southern Africa*, informs us that the isolated villagers of the desert are often compelled to be absent from their homes for weeks at a time, leaving their children to the care of two or three infirm old people. Under these circumstances, the children, some of whom are beginning to lisp, while others can just master a whole sentence, and those still further advanced, romping and playing together, become habituated to a language of their own. The more voluble condescend to the less precocious, and thus from this infant Babel proceeds a

<sup>55</sup> Quoted by Mr. Sayce, p. 186.

<sup>56</sup> Sayce, p. 243.

dialect of a host of mongrel words and phrases joined together without rule, and in the course of one generation the entire character of the language is changed."

The same process appears to be going on in many of the Polynesian Islands, where certain expressions are tabooed and others invented in place of them. This takes place according to no grammatical rules.

The mode in which words are introduced into a language is curious, sometimes ludicrous. Amongst the red Indians near Fort Vancouver, in the Hudson's Bay territory, the common salutation on meeting each other is "clak-hoh-ah-yah," which seems a formidable Turanian word. It is, however, of English parentage, and arose in this way. A person named Clarke occupied a prominent position at the fort, and when he turned out in the morning, his numerous friends greeted him with the usual inquiry, "Clarke, how are you"? The natives constantly hearing this, imagined it to be a general form of salutation, and adopted it in the form above.

The passage from the Latin word *pilus*, to English *wig*, is a singular specimen of derivation. *Pilus*, by a common interchange of *l* and *r*, became in Italian *perruca*, in French *perruque*, which in English was metamorphised into *perwiche* and *perriwig*, and, by the usual English tendency, the first part of the word was abandoned, and it was shortened to *wig*.

All languages, in their early stages, abound in epithets which are restricted to particular objects or actions, and are only gradually superseded by general terms, embodying some idea common to all. Grimm says, "The idiom of nomads contains an abundant wealth of manifold expressions for swords and weapons, and for the different stages in the life of their cattle." Lady Juliana Berners, in the fifteenth century,<sup>67</sup> informs us that we must not use the names of

multitudes promiscuously, but, "a congregation of people, a host of men, a bevy of ladies, a herd of deer, a siege of herons, a muster of peacocks, a flight of doves," &c. So, in the Sanskrit language, water to drink, standing water, flowing water, have each a separate word to express them, besides the general term *jalam*, for water as a fluid. The idea of *going* has no general term, but is expressed by forty or fifty different words, according to the particular class of movement intended. In the earliest stage of language, every action or thing appears to have had a specific phonetic expression, and it has been out of this wealth of raw material that general words have been evolved.<sup>58</sup>

The narrow limits of this address will not permit me to enlarge upon this phase of linguistic science, but it will be evident that the points in dispute present subjects for inquiry of a very attractive and interesting character, whether it be possible or not to arrive at a satisfactory solution. There is yet one inquiry, collateral, but closely connected with the subject, on which I wish to say a few words before concluding. I mean the relations of thought and speech. The inquiry is to a considerable extent metaphysical and psychological, yet it has an important bearing on the history and development of language. Some philosophers maintain that language is essential to thought—without speech, no reason. Others contend that, as thought precedes language, which is merely its expression, it must, to a certain extent at least, be independent of speech. The weight of authorities is undoubtedly on this side of the question. Locke maintains that we can form mental conceptions and propositions without words; that words are signs added to our conceptions, and added arbitrarily. At the same time he admits

<sup>58</sup> Languages in a low state of development are rich in words expressive of the most minute differences, but poor in general expressions.—Max Müller, *Chips*, vol. 4, p. 124.

that it is almost unavoidable, in treating of mental propositions, to make use of words, and, further, that it is possible to use words without ideas. "Most men," he says, "if not all, in their thinking and reasoning within themselves, make use of words instead of ideas, at least when the subject of their meditation contains in it complex ideas."<sup>59</sup>

Dr. Thomas Brown says, "That man can reason without language of any kind, and consequently without general terms—though the opposite opinion is maintained by many very eminent philosophers—seems to me not to admit of any reasonable doubt, or, if it required any proof, to be sufficiently shown by the very invention of language, which involves these general terms; and still more sensibly by the conduct of the uninstructed deaf and dumb—to which also the evident marks of reasoning in other animals—of reasoning which I cannot but think as unquestionable as the instincts that mingle with it—may be said to furnish a very striking additional argument from analogy."<sup>60</sup>

Amongst later writers, Mr. Sayce<sup>61</sup> says, "Language is the outward reflection and expression of thought, or, more accurately, it is the best attempt we can make to represent externally, and communicate to others, what is passing in our own minds. It is true that it can only be an attempt; no outward representation of thought can be otherwise than inadequate. But for all that, it does represent and embody thought, and words are as much fossilised ideas as the petrifications of the rocks are fossilised relics of the creatures of old time. Thought creates language, but language, in its turn, creates thought."

The question whether language is necessary for reason and thought has been brought into remarkable prominence within a recent period. Mr. Darwin's work, *On the Descent*

<sup>59</sup> *On the Human Understanding*, iii. 2, iv. 5.

<sup>60</sup> *Works*, i. 475, ii. 446.

<sup>61</sup> *Contemporary Review*, April, 1876.

of *Man*, published in 1871, gave a shock to the usually received opinions on the radical and generic distinction between man and the lower animals; the theory of evolution and development, so powerfully advocated by this distinguished philosopher, laying down the principle that the difference was one of degree rather than kind. It was denied that articulate speech is essential to reason and thought, and maintained that human language started from the same level as the note of the cuckoo or the barking of the dog.

Professor Max Müller, seven years before the publication of Mr. Darwin's work, had laid down with great force the very opposite theory. He says, "As a matter of fact we never meet with articulate sounds except as wedded to determinate ideas, nor do we ever, I believe, meet with determinate ideas except as bodied forth in articulate sounds. This is a point of some importance, on which there ought not to be any doubt or haze, and I therefore declare my conviction, whether right or wrong, as explicitly as possible, that thought, in the sense of reasoning, is impossible without language. . . . We must concede to animals sensation, perception, memory, will, and judgment, but we cannot allow to them a trace of what the Greek called *logos*, i.e., reason."<sup>22</sup> Again, "Without speech no reason, without reason no speech. It is curious to observe the unwillingness with which many philosophers admit this, and the attempts they make to escape from this conclusion, all owing to the very influence of language, which in most modern dialects has produced two words, one for language, the other for reason; thus leading the speaker to suppose that there is a substantial difference between the two, and not a mere formal difference." In support of these views he cites Hegel and Schelling.<sup>23</sup>

<sup>22</sup> *Lectures*, 2nd ser., p. 62.

<sup>23</sup> Quoted by Pott, *Etymolog. Forsch.*, ii. p. 261.

In December, 1872, Mr. Müller delivered the Roscoe Lecture in Liverpool, in connection with this Society. The subject was "Darwin's Philosophy of Language,"<sup>44</sup> in which the Professor controverted the development theory, and maintained that language is the true barrier between man and beast. The subject slumbered for more than a year, but in July, 1874, an article appeared in the *North American Review*, from the pen of Prof. Whitney, of Yale College, professedly a review of a work by Schleicher, *Ueber die Bedeutung für die Naturgeschichte des Menschen*, but in reality a somewhat severe commentary on Mr. Müller's lecture. He observes, "Reason is that power over general concepts which we possess, and which is so much higher than anything possessed by brutes, that it is properly called by a different name." Mr. Müller had conceded to animals "perception, memory, will, and judgment," but denied them "reason." On this, Mr. Whitney remarks, "To put the formation of general concepts at the very top, and the power of weighing probabilities and calculating results, even genius itself, far below, is to turn the natural order of things topsy-turvy. Nor is articulate language, or language of any kind, the only intelligible manifestation of reason. There is rational conduct as well as rational speech, and it is quite as effective as speech." Both in this review and in his previous work on language, Mr. Whitney contends, with earnestness, Mr. Müller's theory of the identity of speech and reason.

In the *Contemporary Review*, for September, 1874, Mr. George Darwin published an article, ostensibly on Mr. Whitney, but in reality a reply to Mr. Müller's strictures on Mr. Charles Darwin's *Descent of Man*, in which he puts forward Mr. Whitney as the supporter and champion of views of a decidedly opposite character.

<sup>44</sup> Subsequently published separately.

In January, 1875, Mr. Müller again entered the field, by an article in the *Contemporary*, entitled, "My Reply to Mr. Darwin," in which the whole ground is again traversed. In the course of his remarks he quotes Professor Carriere, of Munich, animadverting on Mr. Whitney, as follows:—"The American scholar did not see that language is meant first for forming, afterwards for communicating, thought. We can have sensations, desires, but we cannot think, in the proper sense of the word, without language. Every word expresses the general. Mr. Whitney has not understood this, and his calling language a human institution is very shallow."

At a subsequent period of the same year appeared vol. iv. of Mr. Müller's *Chips from a German Workshop*, in which, in addition to the reply to Darwin, there is an article entitled, "In Self-defence—Present state of Scientific Studies," calling attention to the difficulties of the evolutionist theory, and further explaining his own views. In the course of his argument he quotes Professor Prantl, of Munich, on the essential unity of thought and language, as follows:—

"Realised thought, or, what others might call the realisation of the faculty of thought, exists in language only, and, *vice versa*, every element of language contains thought. Every kind of priority of real thought before its expression in language is to be denied, as well as any separate existence of thought."

The controversy, by this time, had grown rather warm, and perhaps it was as well that it was carried no further. Professor Steinthal, of Berlin, had had a previous encounter with Professor Whitney, a specimen of which is quoted by Mr. Müller. It reminds one more of the time of Milton and Salmasius than of the courtesy of modern times. Steinthal calls his opponent "a horrible humbug;" "a tricky attorney;" "a scolding flirt." "Whenever I read him, arrogant vanity grins at me."

Where such irreconcilable differences exist between learned professors and high authorities on a subject of interest, both historical, ethnological, and scientific, it appears presumptuous to offer any suggestions; but in some of its aspects the dispute almost reminds one of the contest à outrance of the knights as to the shield, whether it was gold or silver, without examining if it might not have two sides. Much depends on the meaning of the terms employed. There seems at one point a very close approximation between the two schools. Professor Müller attributes to animals "perception, memory, will, and judgment," but denies them reason. Dr. Brown asserts that the marks of reasoning in the inferior animals are unquestionable. Now, what is the difference between reason and judgment? Kant, in his *Critique of True Reason*, says, "Sense delivers up its presentations in space and time to the understanding, whose office it is to introduce into them unity and system. This is done by the faculty of *judgment*, which combines the multi-form data of sense in the unity of propositions." Judgment must act by comparison, coming to a conclusion by the examination of evidence. If, then, animals possess this faculty, it seems hard to deny them the possession of thought in its primary elements. If a dog scratches for admission at the front door, and, finding no entrance, goes round to the back, there must be the memory of two things — a comparison between them and a conclusion drawn. If reason be limited to the power of combining ideas and forming abstract conceptions, undoubtedly it is not possessed by brutes; and here seems to be the impassable barrier between man and beast. The combination of ideas derived from perception requires symbols of some kind, but not necessarily those of articulate speech. It is probably true that without language there would have been no power of forming such general ideas; but, once formed, other symbols may be used with

equal effect. The case of deaf mutes is often alluded to. Mr. Müller says, "The deaf and dumb are taught to think the thoughts of others, and if they cannot pronounce their words, they lay hold of these thoughts by signs that appeal to their sense of sight. These signs, however, are not the signs of things or their conceptions as words are ; they are the signs of signs, just as written language is not an image of thought, but of the phonetic embodiment of thought." This seems a very extraordinary statement. Does the Professor mean to say that when a deaf mute expresses in the language of signs that he has seen a horse or a camel, the gesture does not refer directly to the animal, but to a sound which he never heard and has not the slightest idea of ? In combining concrete ideas so as to form general notions, the phonetic symbol has to be supplanted by a gesture ; but it is just as much a direct symbol as the phonetic sign for which it is a substitute.

The inference from the whole appears to be, that as language is the expression of thought, thought, in its perceptive form, must precede language ; but in forming general ideas, where combination and comparison are required, the mind cannot proceed without symbols, which are furnished primarily by articulate speech alone.

I fear that I have somewhat tired your patience by the length of this Address, notwithstanding the very brief glance I have been able to devote to many parts of the subject, which it would have been interesting to dwell upon.

The study of language as a science has hardly half a century to look back upon. Within that short period it has made wonderful progress, and some of the keenest intellects of the age have devoted themselves to its elucidation. Every year brings fresh triumphs, and discovers law and order in departments formerly considered abandoned to irregularity

and confusion. Language is the link which unites soul with sense, the gift which distinguishes man from the brute, which enables him to hold communion with his fellows, and confers the power of combination which is essential to all progress. The fairy visions of the poet, the profound speculations of the philosopher, the thrilling and exciting periods of the orator are couched in language. From the childish syllables lisped at a mother's knee, through all the changing scenes of life to the last whisper of the departing soul, all our intercourse is carried on in language. Whatever progress the world is to make in the future, it is language which will give the impulse. If a new dawn is to arise upon humanity, and the thick mist of ignorance is to be dissipated, even by a rude disturbance of the mental and moral atmosphere, it is language which will be the instrument —

“ For all the past of time reveals  
A bridal dawn of thunder peals  
Wherever thought hath wedded fact.”

## ON HAECKEL'S HISTORY OF CREATION.\*

By ALBERT J. MOTT.

THE materialistic philosophy of the present day is not often presented to mankind in a perfected form. The more prudent among its teachers commonly avoid its ultimate results, or exhibit them in the hazy shape which allows the imagination to conceive what it will behind them. Sometimes, doubtless, this is done of set purpose by men who are perfectly aware of what the haze conceals, but more often it is the effect of an instinctive wish to see no farther, and to indulge the old hopes of a former faith after its beliefs have been abandoned. In either case there is a want of courage on the teacher's part which deserves no real respect, except so far as it represents the protest of his nature against his teaching, and the man who, having adopted a theory, insists on its necessary consequences and boldly faces them, does far more service to the world. Such a man emphatically is Professor Haeckel of Jena, the translation of whose work on the *History of Creation* gives to most Englishmen the fullest opportunity they have yet enjoyed of understanding what the complete doctrine of Development, as applied to life, really means, what is really involved in it, and on what grounds of evidence its truth is maintained. In treating of this subject, Haeckel is a man absolutely without a fear. Believing in no personal creator, in no human identity apart from that of the material organism of the moment, in no future life except that of the race, he is one of the few who find themselves perfectly content with this position and this prospect.

\* *The History of Creation.* By Ernst Haeckel, Professor in the University at Jena. Translation revised by Professor E. Ray Lankester, M.A., F.R.S. 2 vols. London, 1876.

It gives him the highest satisfaction to feel sure that no living being in the universe cares one straw what becomes of him, except himself and his human friends ; that the whole creation is absolutely without a purpose or a plan ;\* that it is bound by laws which act without an object, exist without a reason, and produce things only stronger or weaker, of which the stronger get the upper hand ; that the highest happiness of man† consists in the intellectual enjoyment of this iron-bound nature, and his highest aim, in the knowledge of these irrational laws ; that "highest" in this, as in all other cases, means nothing at all but greatest in quantity or strongest in act, and that to seek or care for anything besides is to mistake for fact what is a mere illusion of the mind.

Setting to work with these views and this feeling, he is, of course, unfettered by any latent doubts, or scruples, or regrets in expounding as complete a theory as he can devise. He does, accordingly, in the most earnest manner, pursue the doctrine of Evolution to its extremest consequences, and he insists on their acceptance as necessary deductions from those partial and really inconsistent views of it which many are fain to hold. In this, his argument is generally unanswerable. He shows that there is no such intermediate stopping-place as timid evolutionists are anxious to find. He fails, of course, and it is marvellous that he does not see it, in excluding purpose and plan from nature by supposing the universe to consist of nothing but matter governed by unchanging laws. Professor Huxley, in his friendly criticism of Haeckel's German work, has pointed out this error. But it is not in the direction of atheism that the gravest consequences of the theory show themselves. It is the credibility of a life hereafter that is really destroyed by it, if it be true at all, in Haeckel's sense. If the highest beings have been developed from the lowest, by merely material

\* Vol. i., p. 20.      † Vol. i., p. 36.

additions and alterations, we ourselves are nothing but protozoa, thus added to and thus altered. Our conscious identity, and all that we call our souls, belong to this special matter in this special combination, and no sort of personal existence apart from it, and no continuance of identity after the combination is once destroyed, can be conceived of as possible. This fatal consequence is the grave difficulty in the path of modern evolutionism, as now embodied in the teaching of the leaders of scientific thought. To men like Haeckel, it is to be met simply by accepting it as a truth, and thinking no more about it. Life in this world, they say, is sufficient for us. Let us make the most of it while it lasts. But to the majority of mankind it is not sufficient, nor is it possible to make the most of it without the hope of a life to come. Hence the various efforts to preserve some ground for such a hope, notwithstanding the logic of the evolution theory. Some, indeed, are satisfied by a simple trust in supernatural power, as able under any circumstances to fulfil the promise upon which Christians have so long relied; but the keener sighted perceive that all the evidence of that promise, and all the reason for that trust, are really swept away by a theory which makes mind itself the mere passing product of the clash of atoms. Some endeavour to escape the difficulty by appealing to the indefinite possibilities lying hidden in the vast region of the unknown; some take refuge in the idea that, while the ancestors of mankind were perishable beasts, a living soul was given to the race when a fitting bodily form had been developed.

I cannot share in the belief that the deepest feelings of human nature will ever find real content in any such compromises between science and religion. The complete doctrine of evolution, as laid bare in Haeckel's volumes, involves a sentence of eternal death upon ourselves, and the feelings

which revolt from such a conclusion should lead us, not to evade it, but to examine afresh, with perfect honesty, but with critical suspicion, the pretensions of a doctrine which has grown up so suddenly, and which threatens us with consequences so tremendous.

I believe we shall find in this, as in so many similar cases, a foundation of most important truth, with a superstructure of most injurious error ; the truth being the discovery of sound scientific thought ; the error, the result of speculative theory and unphilosophic generalisation.

The doctrine of Evolution, as commonly understood, and as expounded by Haeckel, supposes that each of the chief forms of life, except the lowest, has been developed from some other form lower than itself. It supposes, therefore, that progressive forms, in a continued series, have succeeded each other in time ; the lower ones existing first, and the higher ones coming into existence afterwards. The doctrine cannot possibly be true unless this is true ; nor can it be really established while there is any remaining doubt upon this point. The earlier discoveries of geology seemed to leave no doubt, for it was clear that only the fossils of low forms of life had been found in the oldest rocks, and that higher forms had been met with successively in newer rocks, and the relation between the actual life of any period and its geological record was not then understood. But later knowledge has destroyed the seeming validity of this evidence, by continually putting back the date at which the earliest examples of each particular form are severally found, and by the appreciation of other reasons, besides that of successive appearance in time, which make it certain that we must always find less of the higher and more of the lower forms as we go deeper down into the crust of the earth. The first crude ideas have, however, held their ground. Their truth,

as facts established by geology, is still very generally taken for granted to an extent which is not to the credit of modern science, and is assumed by Haeckel in a manner which cannot be too strongly condemned in a writer of recognised authority, whose judgments are supposed to rest on evidence, and not upon mere fancy, seized on to support a theory.

\* "The five great main divisions of the organic history of the earth," says Haeckel, "we call the primordial, primary, secondary, tertiary, and quaternary epochs. Each is distinctly characterised by the predominating development of certain animal and vegetable groups in it."

This statement, of course, supposes that we know which groups of animals and vegetables really "predominated" on the earth during each of these epochs. But we have no such knowledge, nor any means of obtaining it, as Haeckel himself shows in the next two pages, where he states the indisputable fact that, in the seventy thousand feet in thickness of the Laurentian, Cambrian, and Silurian systems, a thickness which, in his belief, required many thousands of millions of years for its deposition, by far the largest portion is in that metamorphic state in which no fossil forms can be recognised. Yet, on the few remains which have been found here and there, as the sole organic records of this vast period, he ventures to settle the question of life on the earth with as much confidence as if he saw it all before his eyes.

+ "What seems to be shown by them," he says, "is that, during the whole of this immense period, there existed only inhabitants of the waters. As yet, at any rate, among all archilithic petrifications, not a single one has been found which can with certainty be regarded as an organism which has lived on land."

\* Vol. ii., p. 8.      + Vol. ii., p. 10.

But who expects to find organisms which have lived on land at the bottom of the ocean ? and where could these great beds be formed except at the bottom of the ocean ? and if land plants and animals are indeed occasionally buried in some portions of marine deposits ; near the mouths of rivers, for example, and along coast lines, where gradual subsidence is taking place ; what is our chance of finding them, with human means of research, when we know that every trace of organism of every kind has been obliterated from by far the largest part of the entire mass of strata ? Yet, because they have not been found where little less than a miracle could have placed and preserved them, "it seems to be shown," says Haeckel, "that during the whole of this immense period there existed only inhabitants of the waters."

This is neither science nor even common sense ; and when the University of Jena, or any other seat of learning, commits itself to reasoning of this kind, it forfeits all claim to confidence as a safe guide to the students of Nature.

What not only "seems to be shown," but is positively demonstrated, by the facts adduced, is that we can learn nothing whatever concerning the existence or non-existence of land organisms, during the period in question, from the mere examination of such fossils as have been found. If a naturalist should go to Africa in search of polar bears, and, finding none, should gravely argue that the race was evidently extinct, we should make short work of him as a scientific authority. There is no reason why we should deal more leniently with those who, searching among the rocks of old sea bottoms, declare that no land animals existed, because no remains of them have been discovered there.

The "predominating groups" assigned to each of the

four succeeding divisions of geological time, by Haeckel, are determined in the same way, on the same false premises; the assumption throughout, that what has not been discovered in a fossil form has not existed in a living state; coupled with an equally astounding assumption of the very opposite kind when his theories require it. He actually proposes to name his great primordial epoch, of several thousand million years' duration, after the Acrania, of which no sort of vestige has been found, on the mere supposition that they *must* have lived then in great numbers, because the fishes of the next age *must* have been developed out of them !\*

It is difficult to read such passages with patience, and it is high time that they should be treated as they deserve.

It must be affirmed, once for all, that, with our present knowledge, the character of the life existing at any former period cannot be established by negative evidence; and, if there were nothing else to appeal to, the question, Whether its highest forms existed in the earliest epochs, or whether they appeared successively in the course of time, would have to remain unsettled, and, in fact, insoluble.

I believe, however, that a sound answer may be given to it by rigorous induction from facts that we are able to observe, and I propose to lay before you what seem to me conclusive reasons for believing that animal life was as abundant and as varied in the earliest period known to us as it is at the present day; that all its typical forms existed then; and that this is not only confirmed by our latest knowledge concerning the earth's physical history, but is the only view entirely consistent with it. If this can be established, the basis of Haeckel's system will disappear.

It is certain that the old ideas about species were entirely

\* Vol. ii., p. 11.

mistaken ; that the essential differences between the forms of living things are not what we formerly supposed. It is a fact that all organisms have a tendency to alter their forms in various directions, and to transmit these alterations to their offspring ; and it is a fact that the struggle for existence causes certain forms to survive while others perish. It follows that if we can trace back the pedigree of any creature now living, we are certain to find that its distant ancestors were not exactly like itself. And it follows, also, that we are not, so far, in a condition to say beforehand how much or how little they resembled it. The history of living things, therefore, has been a history of continued variation of form ; the prevailing forms of any particular epoch being those, among all that the epoch had produced, which were best fitted to survive under the circumstances. This is Darwin's great discovery ; the truth of which is no longer matter of debate.

But the first question which arises, before any further step can be taken, is clearly this : Is the tendency to vary a limited or an unlimited one ? Can any form of life change by degrees into any other ; or is there any definite law of change, either as to degree or direction ?

Now, modern science gives no satisfactory answer to this enquiry, and the reason is obvious. We know that living things grow, but do not know why they grow ; we know that they vary their forms, but do not know why they vary them. This total ignorance as to the cause makes it impossible to determine anything as to the effect by a deductive process, and our observation of what actually occurs is in its nature far too limited for any general induction. The consequence is, that whenever the derivation of one form of life from another form is affirmed, the preliminary question, Whether

this is possible to begin with, receives no scientific answer, even in the simplest cases, except so far as the fact has been observed. When, for example, it is asserted that birds are the lineal descendants of reptilian animals, it is not difficult to point out the changes in form and function that would have been required, or to conceive a process of gradual variation by which these changes might have been slowly brought about, without producing any form of life which appears to us impossible, in any of its stages. But whether the continuance of such a process from such an origin is itself a possible thing, can only be determined in one of three ways. Either the fact itself must be observed; or observation of other similar facts must establish an empirical law which applies to the whole case; or the causes at work must be so far understood that we can say with certainty they are sufficient for the purpose.

Now, the fact has not been observed, nor is it pretended that we know the causes of variation; and as to the laws, if any, by which their action is limited, our ignorance is equally profound.

When the germ of a reptilian egg grows into its own special form of life, some cause is acting, of which this is the effect. We know that that cause, whatever it may be, is able to produce from this germ a living creature somewhat different from its parents, and we know that this living creature, through succeeding generations, may be the ancestor of others, each exhibiting some kind of variation. If this power of variation, in a line of lineal descent, has no limits, then, of course, any living creature may, in the course of time, have any other form of life among its direct descendants. But if it has any limits, then the possibilities of the case are absolutely determined by them.

This question, so vital to the Evolution theory, has never been grappled with by its supporters. In practice, the fact

of limitation in the power of varying is alternately affirmed and denied by them. It is denied when the lowest form of life is supposed to be the origin of all other forms. It is affirmed when the possibility of the opposite process is set aside. It is further affirmed in a vast number of particular cases. It is not believed, for example, that a perfect reptile could be the ancestor of birds, or a perfect bird of mammals, or a perfect ape of men. It is not supposed that any future descendants of the horse will have wings, or that shell-fish of some other age will trace back their pedigree to eagles. Yet the admission of these various limits lays a prodigious weight upon those who undertake to prove that all limitation is removed, if you only begin low enough ; if you take the living powers of a bit of shapeless jelly as the originating cause of every form of life.

Nor is the question answered in the least degree by the discovery of any number of what are called transitional forms. If there is any line which cannot really be crossed, you do not bridge it over by laying stones close to each side of it. Show, as a matter of fact, that the form you call transitional has an ancestor on one side and a descendant on the other, and you settle the question as to whether the first *can* produce the transitional form, and the second be produced by it. But show only that the three forms exist, or have existed, and nothing is settled concerning their relationship. Each one of them, for anything you know, may have had an independent ancestry, from which it may have been quite impossible that either of the other forms could have been produced. Take two similar plants of the same species. Grow them under the same conditions, but propagate them separately. After several generations, each plant will have descendants differing slightly from itself. The two families will also differ slightly from each other, and, by choosing out

those that differed most, and then taking individuals, some from one family and some from another, you could readily show a complete series of very small variations, leading up from one extreme to the other. Yet each family would, in fact, have followed an independent course of variation. No individual of one family would have had its exact counterpart in the other, and the reason why the transitional series appeared so perfect, while, in fact, two independent pedigrees were included in it, would be simply because the individual differences were very small. Small as they were, however, they constituted impassable distinctions. The offspring of the one parent could never be exactly like any of the offspring of the other. At the same time, some of them would probably be as much alike as the original parents were, and from these a similar process could be repeated.

What is true of individuals would be equally so of groups. If any group, as is generally the case with those which we distinguish as species, continued to propagate itself without mixing with others, a certain amount of variation would occur in the course of several generations. The same thing would happen in the species most like it; and, again, a series of apparently successive changes, from the generic forms in which the two species originally agreed, to any of the extremes of divergence from them, could be made by taking individuals from both lines of descent.

No one doubts that the power of variation, in such cases, is so far limited that whatever changes occurred in one of these lines, the same changes exactly could not occur in the other.

But if at the end of, say, ten generations a certain change of form is established, the successive forms of the nine previous generations are the real transitional forms through which the change has been arrived at, and no other forms, nor any other order of succession, could lead to the self-same result, however closely they might resemble these.

It is equally certain that in the two lines of descent supposed, the successive forms in each line would resemble each other so closely that we could not separate them with any degree of certainty if they were mixed.

Again, we see that the real transitional nature of any form cannot be ascertained by mere comparison with other forms, between which it appears to be the connecting link; and that the smallest differences may, nevertheless, be lines of limitation which could never have been passed.

It follows, therefore, that if in this or any previous age we find a bird, for example, very nearly like a reptile, and a reptile very nearly like a bird, we have, nevertheless, found nothing which really indicates any necessary connexion between them in any part of their pedigree. Each line of descent may have extended back indefinitely, with a constant difference from the other line which could never be effaced.

It follows, further, that if at any former epoch the world was filled with life, in as much abundance and as great variety as now; if earth, air, and water swarmed, as now, with suitable inhabitants; if every known type of visible organisation, from the simplest to the most complex, was fully represented, let us say in the Laurentian period; the condition of things as we find them at the present day would be only the natural and apparently the necessary consequence. Each line of continuous descent would have produced a series of variations, the direction and the limits of which would in each case be determined primarily by the nature of the individual at the head of the pedigree. No individual now would be exactly like his distant progenitor; and where the differences between individuals were small, it would often be impossible to say to which line of descent either of them really belonged. Many families would have died out in the course of ages. Many others would have multiplied them-

selves into several divergent branches, differing from one another as much, and not more than the previously existing families had differed, but never producing the same thing exactly a second time.

Well, this is the real history of life, as far as we fully know it.

Geology gives a tolerably complete account of it during the recent period—using the word recent in a general, not a technical, sense. As long as this account is thus complete,—as far back as there are abundant records of what happened on land and water, in all their various conditions,—we know that life existed everywhere and in all typical forms. But as the view recedes, and we look further into the past, the records become continually more fragmentary, and the history of the land passes very rapidly out of sight. At last we have nothing left but the history of the water, and, finally, scarcely anything but that of the deep sea. Of course, our knowledge of life, as a whole, diminishes in the same degree, but we still find equal abundance and variety wherever the record gives a full account of it in any one direction.

Supposing this to be true throughout, it is obvious that we can get no nearer in this way to any knowledge of a common ancestry for existing forms of life. We shall only find the present types existing at the most distant period to which the world's history can be traced ; and, following their lines of descent, we shall notice a constant variation in details, but a constant resemblance in essential characters. And the conclusion will be unavoidable, that the power of variation explains the changes that are known to have occurred, but cannot explain the origin of those essential characters which are not known to have been changed. And, consequently, that variation, so far as our knowledge extends along the direct line of descent from any individual parent, is the

result of a distinctly limited power, and that any difference, however small, which lies beyond this limit, can never be arrived at by the descendants of that individual.

But neither the nature nor the cause of the limit are known to us, and we can never say, therefore, whether or not a particular change could occur in a particular pedigree, except so far as a practical law of change has been established by actual observation.

What, then, are the means of observation by which any such laws can be established? It is here that we come face to face with Haeckel's entire system, which is, indeed, nothing but the Darwinian theory, combined with the general doctrine of Evolution, and both laid bare to the roots. We must begin at the beginning to get any clear notion of the ground on which it rests.

Haeckel begins, naturally enough, with the nebular hypothesis, and takes for granted that this is true. The world, therefore, was once a molten mass, which has gradually cooled. It was, therefore, much hotter in the Laurentian period than it has ever been since. The atmosphere was also different, and the earth was not yet fit for organic life, except in the sea. The only animals were protozoa, and the only plants algae.

Such a beginning leaves only two alternatives in accounting for the rest. Either subsequent organisms must have been created, or they must have grown out of the primeval ones. The idea of creation being too absurd to think of, in Haeckel's view, the other alternative alone remains, and protozoa and algae are necessarily the ancestors of all other living things. As even these have to be accounted for, and as they could not form part of the original nebulous mass, inorganic matter is supposed to have produced them by some

mechanical change in its molecular motion, on the cooling of the earth's crust.

Thus we have a fair start, always granting the nebular matter, and the forces found therein.

The propagation of life from generation to generation is subject to the two great laws of inheritance and adaptation. The general characters of the parent always are, and the special characters always may be, inherited by the offspring. During the life of an organism, every part of it has a tendency to vary in such a way as to adapt itself to the conditions by which it is surrounded. Every parent becomes more or less modified in this way, and transmits more or less of the same modification to the form of its offspring. This power of adaptation is unlimited, according to Haeckel,\* except in the essential fundamental qualities of the "type" to which the individual belongs; and these original types are themselves the earliest forms of variation which arose in the first and simplest form of organic life.

Thus we have first a nebulous mass; then a world too hot for life, but gradually cooling; then, at a given point in temperature, the production of the first organism by chemical action among the inorganic elements; then a constant change of external conditions, with a constant adaptation of organic forms, through variation, inheritance, and natural selection of the fittest, and thus the successive development of all living things.

The theory is complete in itself; but what are the real grounds we have for believing it to be true?

We must first observe that, if the theory is to stand at all as a philosophy of life, no part of it can be dispensed

\* Vol. i., p. 250.

with. If all living forms are derived from a primeval organism, that organism must be itself accounted for. If it is accounted for as the result of special chemical action at a particular period, there must be a reason for that action.

If the reason is found in the cooling of a heated globe, the production of such a globe must be explained. The materialist may reasonably stop here, and maintain that, as far as life is concerned, he has gone back far enough when he has traced its causes to the mechanical and chemical forces by which a nebulous mass becomes a world. But he cannot stop sooner, without leaving the field equally open for any other hypothesis concerning the origin of living things.

The nebular hypothesis is therefore the foundation of Haeckel's system. Its truth is commonly taken for granted; but, as a matter of fact, there is no real evidence to sustain it, while there are grave objections which cannot be removed.

All we know about it is, that the formation of a system of revolving bodies, on the general plan of the solar system, out of a nebulous mass acted on by gravity, is mathematically possible under conditions which can be named. But we do not know whether it is physically possible, or whether the needful conditions ever have existed, or could exist.\*

This is sufficient to remove it from the sphere of scientific knowledge to that of mere speculation; and, as the hypothesis is important in Haeckel's system, chiefly because it gives him a molten world gradually cooling, while I shall show independent grounds for rejecting this idea, so far as the history of our planet is known, I pass on now to the geological evidence on the subject of evolution, which has been strangely misinterpreted.

It is quite certain that in the Laurentian period the surface temperature of the earth was substantially the same

\* See Note A.

as now ; for there was land and water, and there were plants and animals. It is equally certain that the temperature of the crust was similar to the present temperature for a depth of several miles, for the deposits of that period have been upheaved from that depth, and they have not been acted on by heat of an exceptional kind. It is improbable that this could be the case if the earth had really been cooling through that enormous length of time.

The fact that rocks which have been melted are found under those of the oldest sedimentary kind, gives no support to the theory, for we only know this where the sedimentary rocks have been upheaved ; and, as their upheaval has either been caused by volcanic action, or, at all events, associated with it, we expect to find evidence of such action underneath them ; and the natural evidence is found in molten rock, and molten rock of quite similar character is known to have been produced in recent times.

It is certain, as already stated, that in the Laurentian period the earth's surface consisted, as now, of both land and water ; that rain fell, and that it was carried by rivers to the sea. This is proved by the deposits themselves.

Sedimentary beds, formed slowly in vast periods of time, can only be formed by the constant conveyance of fresh material into the seas of which they compose the bottom.

This is equally true whether they subside from mechanical suspension in the water, or are the result of its evaporation, or, as is generally the case, have their origin in organic life.

No seas could hold at one time, either in suspension or solution, more than the merest fraction of those enormous beds which have, in fact, been deposited.

The material, therefore, has been brought by a process as gradual and as continuous as its deposition, and there is no reasonable explanation of such a process, except the common

sense one of rain and rivers. But this carries back still further the uniformity of the earth's general state and general temperature, for the existence of the same condition of things upon its surface involves the pre-existence of similar causes.

The Laurentian rocks differ from recent ones in nothing that is not the natural result of time. They give no indication of material derived from other sources, or by other means, than those now existent. But observe the inevitable inference, which is entirely overlooked by writers of Haeckel's school.

The largest sedimentary deposits in the known crust of the earth owe their origin, not to mechanical, but to vital operations.

The only important sedimentary beds, the formation of which is independent of vegetable or animal life, are those produced by the action of waves on coast lines ; by inundations of the land ; by rivers, about their mouths, and by the drifting of ice. These are often of great thickness, but they are necessarily of limited extent. The really vast beds have been formed over large areas of sea bottom, and the conveyance and deposit of the material both involve the aid of organic life.

The material thus diffused over wide oceanic spaces does not come in mechanical suspension, but dissolved in the water ; and the great solvent power which rain exerts depends on its passing slowly through pulverised and porous soil, in which it meets the earthy elements in a condition favourable to solution, and remains long in contact with them and with the harder rocks, upon which they hold it like a sponge.

It depends also on the absorption of carbonic acid and other gases which are formed by the decay of organic matter in this spongy surface. The soil itself is chiefly the result of

organic decomposition, and of the action of living plants upon inorganic matter.

This is the way in which earthy materials come to be dissolved and carried to the sea; and it is only when thus dissolved that they go in large quantity to any distance from the land, and are capable of being deposited again over great sea-beds. The mud brought by rivers, in mechanical suspension only, falls to the bottom, near their mouths. The cases are rare in which it is carried in any quantity more than two or three hundred miles from land.

And, as organic action has been necessary, in order to get the material thus dissolved in the water, it is needed again to get it out of it. Constant evaporation from the surface of the sea, and the constant return of part of the water with earthy matter in solution, would end at last in a saturated ocean, from which any further additions would be precipitated. But such an ocean can never have existed, for it would have remained saturated with soluble matter, and would in that state have been unfit for the support of life at any future time.

The present seas are not saturated with any substance whatever.

Saturation never takes place, because the soluble matter brought by every river to the sea is there extracted from the water by living organisms, and then deposited afresh upon the ocean bed in the various forms of animal and vegetable waste, and the products of its decomposition and disintegration.

The power of living organisms to select, and so to aggregate, particular materials contained in mixed solutions, and to break up chemical combinations by extracting certain of their elements, is perfectly established.

That this is the true origin of most of the sedimentary rocks, and that mere mechanical subsidence of undissolved

matter plays only a secondary part in their formation, has become more and more certain as our knowledge has increased, and the cruise of the *Challenger* has confirmed this general principle in the strongest way.

The proportions in which the various elements are found in different strata; the order of their deposition; the mode of their distribution; the localisation of the rarer kinds, such as many of the metals, all of which doubtless exist in sea water, while they are only extracted from it and rendered capable of deposition by special organisms; all these most important and interesting facts will probably be explained hereafter by further knowledge of the operations of life.

On a careful view of the matter, therefore, it appears that our knowledge of sedimentary strata is the knowledge of rocks which required generally for their formation the joint action of plants on the land and animals in the sea.

But this includes the whole history of the earth's crust, as far as geology can trace it; and we find ourselves obliged to suppose the world, at the beginning of the Laurentian period, in a condition of which the main features cannot be distinguished from those of its present state.

And not only this. We get no explanation whatever of the mode in which that condition was arrived at, nor do we find a single indication of any nearer approach to a molten or an uninhabited earth. The Laurentian continents, out of which the rocks of the next period were formed in the Laurentian seas, were themselves raised from ocean bottoms, where they also had been formed from materials brought from previous continents of a similar kind. One vast epoch rises behind another in endless series, and nothing that we have real knowledge about shows us the way in which a world

cooling from incandescence could form itself into a world like this.

The close interdependence of the different parts of the organic world makes any hypothesis which dispenses with any of them in any former period at least a dangerous one, for our experience is limited to a world in which they mutually support each other ; and it is always doubtful whether we can correctly conceive the results of parting with any one of them.

Now, the relation between plants and animals is at present of the most intimate and complex kind.

There is a common notion that, as a necessary condition of life, animals require plants, but plants require only inorganic materials.

Yet, as a matter of fact, animals give to plants at least as much assistance as they receive from them. The first thing necessary to vegetable life is a supply of carbonic acid in the air, and one of the daily sources of this supply is the oxidation of carbon in the bodies of living animals.

Human beings, on an average, exhale at least one hundred pounds weight of carbon, in the form of carbonic acid, annually, for each person, or at least fifty million tons per annum from the whole human family. This is sufficient for the formation of twice that weight of dry vegetable matter ; and if the annual product of the soil is estimated at about three tons per acre, or two thousand tons per square mile, the whole vegetable product of fifty thousand square miles, which is the area of England, is provided for by the carbon oxidised in the bodies of the human race alone.

The number of the larger mammals, including horses, cattle, sheep and pigs, is, in England and France, about four hundred to the square mile. If this were the general average, these animals would be about twenty times as numerous as the

human race. The average amount of carbonic acid exhaled by them must exceed that of an equal number of men ; and, though no general census of the large mammalia can be taken, their great importance in the supply of this essential gas is beyond dispute. If we then consider the multitude of other animals in the world ; the swarms of the smaller mammalia ; the myriads of birds ; the incalculable extent of insect life ; and if we add to this the animal products of the ocean, where, if oxidation is slow, the agents employed are in number beyond all arithmetical expression, we must feel immediately that, whatever other sources may supply carbonic acid to the atmosphere, the quantity furnished by living animals is so enormous, that without it the present growth of vegetation could not take place.

Besides carbonic acid, a certain quantity of nitrogen is indispensable to the growth of plants. Whether inorganic chemistry is the primary source of the supply, is undetermined, but it is certain that animals provide nitrogenous compounds in the form best suited for assimilation by plants more rapidly than the natural decomposition of vegetable matter would produce them. The supply of nitrogen, therefore, in these forms would at least be reduced if there were no animals.\*

Still further, the soil in which land plants flourish is loosened and pulverised to an incalculable degree by worms, larvæ, and other burrowing animals, without the aid of which its power of absorbing moisture, and its suitability for receiving and nourishing the roots of plants, would be to a great extent destroyed.

It appears, therefore, that even if vegetation could continue to exist at all, for any long period, without the aid of animal life, in its present varied forms, it would do

\* It appears probable that even lichens cannot live without the help of organic matter already in the air. See *Nature*, No. 370, p. 108. Prof. Calderon's experiments.

so under such disadvantages, that it would be contrary to reason to believe that any approach to the present luxuriance of vegetable growth could be maintained.

Proofs of abundant terrestrial vegetation in the palæozoic rocks are therefore the strongest evidence in favour of an equally abundant fauna co-existing on the land.

The notion that an atmosphere highly charged with carbonic acid gas is required to explain the coal deposits of the carboniferous era, is one of those fictions of the imagination which encourage a belief that facts are accounted for in a manner agreeing with our theories, when they have really not been examined with care.

A large excess of carbonic acid gas in the air during the earlier epochs of a cooling earth, and an extraordinary development of plant life before the advent of animals, would suit the common theories of evolution; and it is convenient, therefore, to assume them as facts.

But the proportion of carbonic acid now in the air, if constantly maintained, is sufficient for the most luxuriant vegetable growth of which we have any indication, past or present; and the total quantity of vegetable carbon now in the ground prodigiously exceeds the utmost that could ever have been in the atmosphere at any one time since the first sedimentary rocks were formed. It is in the sources from which carbonic acid is continuously supplied, and not in its pre-existence in overwhelming quantity, that we must seek the history of the carboniferous deposits beneath our feet.

The luxuriance of vegetable growth depends primarily upon temperature, moisture, permeability of soil, and the supply there of various substances in a soluble form. It is variations in these, and not in the supply of carbonic acid, which is the same everywhere, that make at present all the

difference between a tropical jungle and a sandy desert. Of course, there must be, as there is now, sufficient carbonic acid, or there will be no vegetation ; but that condition being satisfied, the amount of vegetation is determined now by the causes above enumerated. And where the circumstances are favourable, the present rate of production, with the present atmosphere, is quite as great as there are any reasons for supposing it to have been in any former times.

Sir William Thomson calculates that the amount of dry vegetable matter produced annually in a German fir-wood, is equal to about one pound on every ten square feet of surface.\* If one-half of this were deposited as coal, it would be equal to a layer about a yard thick in five thousand years. Now, the produce of the tropics is probably several times as great as that of a fir-wood in Germany. So that it is clearly possible for vegetation, growing in the present atmosphere, and under existing conditions, to produce a bed of vegetable matter, equal to a seam of coal a foot thick, in a few centuries. There is nothing whatever to make us believe that any of the known coal fields were deposited more rapidly ; and the theory of a more abundant growth of plants, in an atmosphere more highly charged with carbonic acid, in former times, is, in fact, without a vestige of foundation.

I am brought, here, to a subject of extreme interest and importance, which attracted the notice of Liebig, and still more of Bischof, but which, I venture to think, has been misinterpreted, partly through theoretical prejudice, and partly through the want of definite information, which has only been very recently supplied.

Carboniferous deposits are, without doubt, deposits chiefly of vegetable matter, grown on the surface of the earth.

\* *Philosophical Magazine*, vol. 4., 4th series, 1852, pp. 266-260.

Plants so growing derive their carbon from the atmosphere. The atmosphere contains a certain quantity of carbon in the form of carbonic acid, and the quantity varies only within narrow limits. We know that it can never have been much greater than at present while animal life has been abundant, because it is found, by experiment, that a small addition is injurious and a larger one fatal to animal life; and it can never have been much less while vegetation flourished, or there would have been an insufficient supply. The proportion, therefore, has been about the same as at present for an indefinite length of time, which we might call a million years, with the assurance that this is really only a small fraction of the truth.

Plants decompose carbonic acid, and give back its oxygen to the air. Thirty-two pounds of oxygen are thus given to the atmosphere for every twelve pounds of carbon thus withdrawn from it. Nevertheless, the quantity of oxygen cannot have varied much while there have been living animals, as we know by observing the effect of its increase or diminution.

The destination of vegetable matter is twofold. Part of it becomes the food of animals; part of it falls upon the ground. Most of the carbon in the food of animals is reconverted into carbonic acid and restored to the air; but of vegetable matter falling on the ground, a great part of the carbon remains there. The various kinds of decomposition to which vegetable matter is subject, leave ultimately from one-third to nine-tenths of its carbon, according to Bischof, which is not oxidisable at common temperatures by ordinary natural processes. On an average, it may be assumed that two-thirds of the carbon falling on the ground remains there as a permanent deposit.

The average annual growth of dry vegetable matter in

Germany, as reckoned by Sir William Thomson and by Liebig, is equal to about two tons per acre; but much higher estimates have been made, and, allowing for the rapid growth of warmer countries, as well as for the roots of plants, it will be safe to consider two thousand tons per square mile, or about three tons per acre, as the general average on the earth's land area of fifty million square miles. These estimates, it must be borne in mind, are all made upon measured quantities, taken after the wants of the animal world have been, to a large extent, supplied; for animals live chiefly on the growing parts of plants, and the quantities reckoned as produced are measured after the plants have grown and have been cut down by man. It is not likely that nearly one-half of this residual portion is consumed afterwards as food; but if we allow one-half, it will follow that one thousand tons per square mile return annually to the ground. Of this, nearly half is carbon, and if two-thirds of the carbon remains unaffected by decomposing action on the surface, the final result will be the deposit of three hundred tons of carbon per square mile, or fifteen thousand million tons per annum.

There remains the vast ocean area of one hundred and fifty million square miles, on which abundant vegetation, subject to similar laws, continually grows, and where the deposit of carbon from the exuberant animal life of the waters must also take place on a prodigious scale. There are no data by which the actual quantity can be calculated, and I omit it altogether, as a special and, doubtless, a far more than sufficient security against over-estimates.

The total quantity of carbon always existing in the present atmosphere is about one billion tons, and the total quantity of oxygen is one thousand times as great.

It follows that a quantity equal to all the carbon is extracted from the air and deposited in the ground in seventy

years; while, in about twenty-five thousand years, the oxygen thus restored to the atmosphere is equal to the whole quantity which it now contains.

It follows, further, that in one million years, the quantity of carbon deposited in the ground would be fifteen thousand billion tons, and the quantity of oxygen restored to the air would be eight times the volume of the entire atmosphere.

These figures are sufficiently striking, but I must still call your attention to others not less remarkable.

Liebig supposed that the carbon in the atmosphere was equal in quantity to that of all the coal in the world. Bischof perceived that this must be an error, and has made some striking remarks upon the subject. But the elaborate statistics, and careful estimates of the recent Royal Commission on the supply of coal, were needed to furnish the data necessary for conclusive reasoning. It now appears that the total quantity of unoxidised carbon under the British Islands, cannot be less, and is almost certainly immensely greater, than three hundred and fifty thousand million tons. This total is thus arrived at. The quantity of coal which the Commissioners estimate might actually be got from depths not exceeding four thousand feet in the areas occupied by the coal measures, is:

	Tons.
In seams not less than 1 foot thick	146,000,000,000
And at a greater depth ... ...	48,000,000,000
Allowed for waste in getting, about	<u>80,000,000,000</u>
Add to this:	274,000,000,000
The quantity in seams, less than 1 foot thick, at least $\frac{1}{4}$ th ...	45,000,000,000
Bituminous matter in the various shales, at least * ... ...	<u>40,000,000,000</u>
Making a total of ... ... ...	359,000,000,000

Some shales actually contain twenty-five per cent. of bitumen.

Now, this refers only to the coal-fields proper, which cover only one-twentieth of the whole area, and it supposes the other nineteen-twentieths to be destitute of carbon. But this is so far from being true, that nearly every geological formation contains unoxidised carbon in greater or less degree. The estimates, also, are limited to an extreme depth of little over a mile, while the sedimentary strata are many miles in thickness. It is, therefore, quite certain that the true quantity is enormously greater than the estimate given above, which, for the entire area of Great Britain and Ireland, is equal to an average of three million tons per square mile.\*

Now, there is no real reason to believe that the average is greater here than in other parts of the world. The great productiveness of our coal-fields has been due to their position and to the energy with which they have been worked, and not to any exceptional abundance in the deposits themselves. No one was aware of this a few years ago, for coal-fields are not discovered till they are looked for, and their true extent cannot be estimated without elaborate examination. But it is known now that vast quantities of coal, and of other carbonaceous matter, exist in every part of the world; and many great coal-fields have already been shown to be richer in average quantity than ours. Nor is there any doubt that such deposits exist under the sea as well as under the land, since all the known coal-fields have been below the sea bottoms of former days; and the submarine deposits, not having yet been subjected to much denudation, are likely to be even more extensive on that account.

The estimates, also, being limited to the coal-fields proper, and to so moderate a depth, exclude far more than they include. In the Laurentian rocks of America, for

\* See Note B.

example, the quantity of graphite is so enormous that Professor Dawson supposes it may be equal to all the carbon in the coal formations.

Bischof, estimating the carbon in the sedimentary rocks from data of a less definite kind, has found the quantity to be astonishing, and not to be accounted for on the common theories concerning terrestrial physics, and has been led to make the singular remark that carbon cannot be regarded as existing at the time of the creation.\* It is more reasonable to infer that the theories in question cannot be true, for the proofs that carbon existed long before any period known to science are sufficiently abundant.

We may again, therefore, be certain that our estimate must be less, and not greater, than the truth, if we take the average arrived at above, and suppose that the unoxidised carbon in the earth's crust is at least equal to three million tons per square mile, or a total of six hundred billion tons. But even this is six hundred times as much as the atmosphere contains at present, and, if drawn from a denser atmosphere, the proportion of carbonic acid in it must have been six hundred times as great as now.

And, in removing this carbon from the air, the action of plants would release one thousand six hundred billion tons of combined oxygen, which is nearly twice as much as the atmosphere now contains. We know that any such changes in the constitution of the air would utterly destroy every living creature, and that nothing of the kind, therefore, has really occurred during any known epoch; but we also know that this quantity of carbon has really been withdrawn from the atmosphere, and all this oxygen really set free, within a period of not more, and almost certainly much less, than about forty thousand years.†

\* *Chemical Geology*, vol. ii., p. 252.

+ Annual deposit = 15,000,000,000 tons  $\times$  40,000 = 600 billion tons.

It follows necessarily that the carbon thus withdrawn has never existed all at once in the air, but has been gradually supplied to it, and that the oxygen thus released has not been left to accumulate, but has been removed as fast as it came.

How, then, has this been brought about?

Carbonic acid can be expelled from carbonate of lime by heat or the action of other acids; by sulphuric acid, for example, or by silica and boiling water. And the limestone rocks of the earth's crust contain it, of course, in almost unlimited quantity.

But such changes do not appear to be capable of supplying what is wanted, because the altered rocks reappear at the earth's surface, and there go through fresh changes, which enable them to reabsorb carbonic acid. And still further, because if this were the true source of the supply, it would result in a constant decrease in the carbonate of lime, and a corresponding increase in the unoxidised carbon of the crust of the earth, to an extent so prodigious in the course of geological time that it becomes incredible.

And, on the other hand, what substance is there on the earth's surface which is capable of removing the oxygen? Some metallic oxides lose part of their oxygen in contact with organic matter, and may reabsorb it from the air; but we know that only a small proportion of organic matter is oxidised in this way, and, as all the carbon in it must be oxidised, in order to remove all the oxygen previously set free, the process is manifestly insufficient.

Still greater would be the difficulty of understanding how two independent processes could be made to balance each other with such constant exactitude.

If the quantity of carbonic acid supplied to the air is not

determined by the quantity of oxygen withdrawn from it, it is incredible that there should be neither excess of one nor deficiency of the other through centuries and ages.

To make the whole process natural and rational, we ought to find that the carbon and oxygen which are separated by the action of vegetable life, are again united by some other agency; in other words, that the carbon annually deposited in the crust of the earth combines again with the oxygen annually given to the atmosphere. If the two substances are brought together at a sufficient temperature, they combine at once by ordinary combustion, and the question is whether this, in fact, takes place under ground.

Now, physicists have hitherto decided this question in the negative.

It is argued, with perfect truth, that if carbon is oxidised by atmospheric air, the nitrogen of the air is left unaltered, and that if this occurred within the crust of the earth, nitrogen in large quantities must be returned to the atmosphere; and, since the gases known to be discharged from the interior contain a very small proportion of nitrogen, instead of a very large one, it is assumed at once that subteranean combustion cannot take place on any large scale.

I believe this conclusion has been arrived at without sufficient consideration, and that a few facts and figures will show it to be entirely invalid. The whole matter depends on the quantity of nitrogen exhaled from the earth.

When carbon is burnt in air, the residual nitrogen is about ten times the weight of the carbon. If the annual deposit, which we take as fifteen thousand million tons, were burnt, one hundred and fifty thousand million tons of nitrogen would have to be discharged. But this, if spread over the whole earth, would make a layer of nitrogen less than one foot in thickness. If, therefore, the whole earth were

slowly exhaling nitrogen, the required quantity would be discharged, if it rose only at the rate of one foot in a year.

Now, the discharge of gases from the earth is never noticed unless they are rising, not at the rate of one foot in a year, but of many feet in a minute, which is some millions of times faster; so that, in fact, the whole quantity might be discharged from a very small fraction of the earth's surface, and still at so slow a rate that it could not be perceived.

That nitrogen is not found in quantity among the discharged gases hitherto examined is, therefore, a fact of no significance, unless it can be shown that those gases must come directly from the places where internal combustion takes place, if it occurs at all. But the reverse of this is really true.

The discharge of gases is generally observed from the craters and fumaroles of volcanoes, or from fissures in the neighbourhood of springs charged with carbonic acid gas.

In the latter case, carbonic acid is itself the gas chiefly discharged, and this is readily accounted for. The water of springs, when it reaches the surface, seldom contains much more than its own volume of this gas; but lower down, under greater pressure, it dissolves many times its own volume, and carries this with it in its subterranean course. But as the water rises the pressure diminishes, and the surplus gas makes its escape, passing upwards through any fissures open in the ground. Clearly, no nitrogen can be looked for here.

As to the gases issuing from volcanoes. Combustion itself is not likely to be at any time the immediate cause of volcanic action, which much more resembles the effect of the sudden contact of molten matter with water; and the gases discharged are such as might be expected from such a cause. Steam is the explosive agent, and carbonic acid and sulphurous gases are its natural accompaniments, because

these are driven from carbonate of lime and from sulphurets, simply by excess of heat. Carbonic acid also, being largely absorbed by water, is expelled from it by its conversion into steam. In these examinations, therefore, we have looked for nitrogen where we were not, under any circumstances, likely to find it, and no conclusion can be properly drawn from its absence with regard to combustion under ground.

Consider, further, what are likely to be the real conditions of such combustion. Carbon, like other deposits, descends ultimately to a considerable depth, and this is necessary before it can be burnt.

Apart from various reasons concerning pressure and temperature, the mere percolation of water would prevent combustion near the surface. Water may penetrate to great depths, but the rate at which it does so will evidently decrease as the depth increases; and it is the rate, and not the total quantity, that determines this point. Water thrown by teaspoonfuls, at short intervals, on a common fire, will not extinguish it in any length of time, while a moderate quantity, thrown a cupful at a time, will put it out. At a certain depth, which is probably several miles, the rate of percolation will be so slow, that a fire once kindled will not be affected by the ordinary descent of water. A mass of burning carbon in such a position will continue burning with an extremely slow supply of air, because the conduction of heat will be almost imperceptible. If air is in any way supplied, the heated nitrogen and the carbonic acid formed by combustion will slowly rise through the strata above. When water is met, the carbonic acid will, to a large extent, be absorbed by it, and will thus be carried in whatever may be the direction of the subterranean flow, while the nitrogen will pass on unabsoed, and will make its way to the surface by whatever path is open. This natural separation of the two gases is a

sufficient reason why we should not expect them generally to reappear together.

Wherever the heat of the burning carbon is sufficiently intense, portions of the rocks will be melted by it. Once melted, they will continue long in a fluid state, from the slow rate of cooling, and will make their way downwards and laterally, through any crevices in the crust. As such crevices are channels to which water also can penetrate, they will meet occasionally with water in quantity sufficient to cause an explosion, and an earthquake, a volcanic outburst, or both combined, will be the result.

Now, we know that there is a sufficiently high temperature below, in at least a great number of places, to set carbon on fire if air is present. And there are many independent ways by which subterranean fires may be kindled when the fuel is ready, through chemical action, or mechanical friction in the crust.

We also know, from volcanoes and springs, that the earth is full of cracks and openings, which must often be filled only with air.

Every active volcano is like the up-cast shaft of a mine. Its tendency is to draw in a down-draught of air through other openings. And, besides these chimney-like fissures, the earth's crust is full of cavernous hollows, which must often be of vast extent, and in which large quantities of air must frequently be stored. Such hollow chambers are the unavoidable result of movements in the crust, of the expulsion of gases and volcanic matter, and of the solvent action of the water which escapes in springs. And that air must often enter them must be inferred from the extreme rapidity of its movement compared with that of water, and from the very minute openings through which it will pass. If a crack

opens suddenly from the surface of the ground to any depth below, it is filled almost instantaneously with air, long before water has time to ooze into it; and a little irregularity in the direction of the fissure will make the water, when it comes, act as a stopper to all the air beneath it. A column of water only a hundred yards high exerts a pressure of ten atmospheres, and air, thus compressed, will force its way wherever there is least resistance. The high specific gravity of water, compared with that of air, must often also be the frequent means by which subterranean passages are opened to the air. When these are filled with water, which is their general condition, any failure in its support, whatever that may be, causes a sudden fall in the column of water, the place of which is immediately filled with air. The air penetrates, not only directly downwards, but into whatever lateral openings there may be on the way ; and, if the water rises again, the air in these openings is shut up and imprisoned by it.

This kind of up and down movement must be continually taking place in all parts of the earth's crust where the surface is exposed to the atmosphere, and must produce a species of respiration. The sudden drying of wells, so often noticed in volcanic districts, illustrates the process. It means, of course, the sudden fall of some aqueous column, and the consequent opening of a passage for the air.

There appears, therefore, no reason to doubt that air, in large quantities, penetrates the earth's crust to a considerable depth ; that it may often accumulate in subterranean hollows, and that the up-draught of active volcanoes may draw it in a species of furnace blast through the fissures in various strata.

Such being the case, there seems no difficulty in believing that carbon deposited in the earth is slowly burnt within the

crust itself, for the needful temperature and the required oxygen are both supplied.

The nitrogen returns to the air by a process generally imperceptible, although the fact of its presence at great depths, and under very powerful pressure, is made known by its abundance in some natural springs.

Probably it escapes chiefly through the sea, if combustion occurs deeper down than the sea bottom ; for the passage of nitrogen through two or three miles of water would be infinitely easier than through an equal thickness of rock.

If this is admitted, the constancy, of which there is positive proof in the constitution of the air, is perfectly explained, if we suppose further, as there is every reason for doing, that a small excess of carbonic acid in the air stimulates vegetable and depresses animal life, and that the opposite effect is produced by a small deficiency.

In that case, if the amount of carbonic acid exhaled from the crust exceeds the average, there will be a more rapid growth of plants and a less rapid growth of animals, and therefore a larger withdrawal of carbon from the air, and, at the same time, a decrease in one important source of its supply. If, on the other hand, the subterranean supply falls short, the animal life is stimulated, and more carbon is oxidised by that means, while the vegetable world languishes, and less is extracted from the air to be given to the ground.

The quantity of oxygen is, at the same time, kept nearly constant by the same process, which would not be the case by any other.

This is manifestly a self-correcting adjustment, and the process may have continued for an unlimited time.

On an average, the quantity of carbon burnt below must always be equal to that deposited above, because the lowering down of the strata to a certain depth, which is its necessary

condition, keeps pace with their deposition. It will be seen that, on the theory here advanced, this fact also is accounted for.

But, if this be true, it leads to most important results concerning the internal heat of the earth, and the causes of geologic change.

We have estimated the annual deposit of unoxidised carbon on the land surface as fifteen thousand million tons, or about three cubic miles of the specific gravity of coal. On the hypothesis, an equal quantity must be annually converted into carbonic acid in the crust of the earth. The burning away of this quantity of fuel would give room for the subsidence of a thousand square miles of surface, five hundred yards downwards, every century, without reckoning the matter ejected by volcanoes, or the carbonic acid expelled from limestone by the heat.

This would allow an area equal to that of Europe to subside one hundred yards in fifty thousand years, or a yard in five hundred years. Probably this is equal in total amount to any of the observed changes in existing continents.

In practical lime-burning, the coal consumed is found to expel about its own weight of carbonic acid from the limestone; and the latter, which is not pure carbonate of lime, and which has twice the specific gravity of coal, loses about a fourth of its own weight in the process. The burning of a cubic mile of coal, therefore, is able to reduce two cubic miles of limestone to a rock twenty-five per cent. lighter, and incapable, therefore, of resisting the same pressure as before. This is a further cause of depression, and also of internal heat, for the rock thus reduced is brought into the condition of quicklime, and the entrance of water will be followed by the usual rise of temperature.

The combustion of a bed of coal under a bed of lime-

stone would therefore produce, in succession, heat, earthquake shocks, volcanic eruptions, the discharge of carbonic acid in great quantities, the subsidence of the superincumbent strata, fresh heat, from crushing and friction, and from the access of water, and, finally, the re-absorption of carbonic acid by the lime, as the fuel burnt itself out and the local temperature fell. This re-absorption would again expand the rock, and might in itself give rise to a temporary movement of elevation.

The heat which passes outwards from the interior of the earth's crust, and is lost by radiation, has been variously estimated. The highest estimates make it sufficient to melt about seven hundred and seventy cubic miles of ice every year. Burning coal will melt about one hundred times its volume of ice ; and the oxidation of the three cubic miles of carbon, supposed to be deposited annually by land plants, would supply nearly half the heat thus estimated to be lost.

We have then to consider the heat produced by the gravitation of unsupported rocks, in accordance with Mr. Mallet's investigations.

He has shown that if, at the depth of even one mile, any portion of the crust ceases to rest on the solid interior by which it is normally supported, the force of gravitation exceeds the utmost pressure required to crush the hardest rocks into powder, and that, when such crushing takes place, heat is developed which is the equivalent of the mechanical action.

He has also shown that the actual quantity of heat thus developed may be prodigious, if the interior support is from any cause temporarily removed, as it must be whenever a layer of carbon is converted into carbonic acid gas by oxidation.

Adding together, then, the heat produced by the oxidation of the three cubic miles of carbon derived from the land surface; the further quantity that may be due to carbon deposited by marine vegetation, and animal decay; the additional increment from the access of water to burnt limestone; and, finally, the effects of crushing and friction from the gravitation of rocks whose interior supports are burnt away; it appears that the annual loss by radiation must be sufficiently compensated in this manner, even at its highest estimate, which is, moreover, very likely to exceed the truth, while we know that our estimate of the carbon itself must be far below it.

It seems unnecessary to take account of the carbon artificially burnt by mankind. The annual consumption of coal throughout the world may perhaps be as much as three hundred million tons, but this is only two per cent. of the estimated annual deposit from land vegetation.

And it is associated with social conditions involving a higher culture of the soil, an increased production, and therefore a greater annual demand upon the carbon of the atmosphere, and a greater annual deposit from the same source.

And the industry which consumes the coal greatly increases the quantity of carbon artificially deposited in houses, furniture, ships, railways, and other human works; all the wood thus used by man being so much vegetable matter preserved from or retarded in the course of natural decay.

I have treated coal and carbon as if they were synonymous terms, in order to avoid complicated details, and because the difference between them does not affect the general result. When a ton of carbon is converted into coal, the bulk and weight of the fuel are increased, but the heat of its combustion is not greatly altered.

The theory here advanced rests, you will perceive, solely on ascertained facts, and does not require the assumption of causes which we do not really know to be operating. It is a matter of fact that carbon is annually deposited in the ground; carbonic acid is constantly exhaled from the interior of the earth's crust; air does penetrate wherever there are openings, and intense heat does exist below in great numbers of places; and the carbonic acid extracted from the air by plants is in some way returned to it, while the oxygen released is in some way withdrawn from it, without material change in the atmospheric proportion.

The inference as to the actual process is an irresistible one.

All we have had to establish is that its effects are on a scale sufficiently large to explain the facts of observation; and this being placed, as I conceive, beyond reasonable doubt, it follows that geological change, as known to us, is fundamentally dependent, not on physical, but on vital operations, and that the earth is not a cooling body.

And if it should be urged that vital operations owe their energy to the heat of the sun, and that the sun, at all events, must be cooling, the reply is easy.

We do not know the history of the sun's heat, or the source on which it depends, and it is not satisfactorily explained by any existing theory. The proof already given of constancy in the general surface temperature of the earth is equally a proof of similar constancy in the heat of the sun, which, considering the enormous length of the period, is inconsistent with the belief that he is either a simply cooling body, or that his heat is supplied by gradual condensation. The fall of meteoric matter is no longer accepted as an explanation, and simple chemical action is demonstrably insufficient by itself. Doubtless the latter cause might be sufficient, if aided by vital operations, but then, in the sun's

case, we know of no external source from which these could derive their energy, unless they can draw it from the ether of space, and of this there is no evidence.

The violent action manifested in the solar atmosphere is further opposed to the view that the sun is merely a heated body, cooling. In such a body, with no alternations of day and night, and no other globes near him of sufficient size to produce appreciable effects by their attraction, the loss of heat must be uniform, and the change of surface temperature extremely slow; and if violent perturbations and convulsive movements would, in fact, occur, we are at least ignorant of their natural causes.

The true scientific course in such a case is to confess our ignorance, and to acknowledge to ourselves that there are probably sources of heat in nature of which at present we know nothing.

In calculations of this kind the estimates of quantity are necessarily rough ones, and I have, on that account, used round numbers throughout this Paper, an attempt at exactness in such cases being only deceptive. I have taken the greatest care to employ figures that are less than the probable truth; and it is most remarkable that the results of such calculations, from data which are entirely independent of each other, should prove so distinctly comparable.

The earth's annual loss of heat is deduced from observations of the internal temperature and rate of conduction; while it is from the quantity of carbonic acid consumed by plants that I have estimated the heat which the re-oxidation of the carbon must supply.

The length to which this part of the inquiry has been carried is justified by its importance.

As I have before pointed out, the successive appearance in time of the higher forms of life after the lower forms, is a

fundamental necessity in the system of which Haeckel is the exponent, and the gradual changes to which a cooling world has been subjected are so far indispensable to the theory, that without them there is no presumptive evidence in its favour derived from the general order of terrestrial affairs. If the views laid before you are sound, our first acquaintance with the earth's history begins at a period when its surface arrangements were not distinguishable from those of the present time; when the gases of the atmosphere were supplied and removed by the process which still continues; when the rocks were deposited by the help of organic life in the sea, through agencies which necessarily imply its equal abundance on the land.

What reason, then, have we for believing that this abundant life was only of the lowest kind?

The negative evidence is worthless; the positive evidence is all on the other side.

We have no good reason to believe that life, existing at all in a world of this kind, could maintain itself without a general completeness, or that any of its main divisions could be dispensed with by the rest. Plant-eating insects multiply in such a manner that they would generally destroy vegetation if they were not preyed upon themselves. Their enemies are, again, kept down by larger animals, and these are limited in number by the comparative slowness of their own growth, which effectually prevents them from extirpating their food, while, at the same time, they check its undue multiplication. This is a perfect and harmonious system, the working of which we see before our eyes. It is sufficiently elastic to meet the varying changes of geographical and other conditions, but the balance of life is preserved by its silent operation in every corner of the world. What would follow if any part of it were entirely absent we do not know by experience, but we may be very sure that profound

disturbance of some kind or other must be the result, and every proof of close similarity between the present and the past is evidence, therefore, that the general system has been maintained.

The actual discoveries of palæontology are absolutely confirmatory of this view. The invertebrate animals of the present seas are not exactly like those of the earlier epochs, but they are so nearly like them that no one can doubt that the sponges, crinoids, shell-fish, or crustaceans of to-day, are each of them the lineal descendants of sponges, crinoids, shell-fish and crustaceans living in those forms in the palæozoic era. We are equally sure that the fishes of to-day are descended from fishes of that period ; that our reptiles had reptilian ancestors, at least as far back as the trias ; and that of the higher mammalia, every existing individual is so nearly like some fossil in the tertiary rocks, that we are certain it cannot differ from its ancestors of that epoch in general structure, general habits, or the nature of its food.

If we go further back, and ask, What were the predecessors of silurian sponges, or of triassic reptiles ? the natural inference is that they were still sponges and reptiles, filling the same places in the general order of life.

We know that those places have been so filled, and that general order so preserved unchanged, through the incalculable periods which divide the present era, in one case, from the silurian, in the other, from the triassic age, and no reason can be given why it should have been otherwise in ages preceding these.

The evidence necessary to prove the contrary must be of the following kind. There is a difference between the recent forms and the ancient ones. If it can be shown that this difference is the natural result of a constant law of change,

and if, by following the action of this law backwards through a still longer period, we are carried through a natural pedigree to forms which are neither sponges nor reptiles, it is sound reasoning to infer that these were the forms of life from which sponges and reptiles have descended. This is precisely what the doctrine of Evolution pre-supposes, but the proof is always wanting when we look at the facts.

The difference between these living individuals and the most ancient known forms does not give evidence of any constant law of change, from which we must infer that those ancient forms themselves were descendants of organisms essentially unlike themselves. We cannot show that the new forms are the old ones altered by a constant progress or a constant retrogression, or a definite departure from one mode of life in the direction of another mode of life.

The same view is strikingly confirmed by facts concerning the higher animals. Mammalian remains are abundant in the tertiary rocks, but they vanish suddenly when we pass the boundary of this period. The change is not a gradual one. It is from an abundant record to an absolute blank.

What are we to suppose to have been the ancestors of the tertiary mammalia? Were they creatures of the same kind, differing in minor points, but alike in essential ones? or were they creatures of another kind, descendants of the reptilian forms of a former era?

The happy accident by which a few mammalian bones were found in triassic rocks ought to have settled this question. It proved in a moment that the mammalian form, instead of being a new form at the beginning of the tertiary period, had already existed for incalculable ages when that period began. Nor has the fact that the bones hitherto discovered belong to small animals of the marsupial form the least significance in sound reasoning, for marsupials are

among the living forms of the present day, and to know that they descend through an unbroken pedigree from ancestors who were essentially like themselves in the age of the trias, is to leave no reasonable doubt that the same thing is true concerning other mammals. Nor would the strength of this inference be lessened if we should continue to find only marsupial mammals in triassic rocks, for we know that the preservation and discovery of the fossils of land animals of any kind in deposits of that epoch can only be due to some special circumstances relating to those rocks; and if these have, in fact, caused marsupials only to be preserved in one particular case, the same causes are likely to have had the same effect in others.

And having traced back these highest forms of life to that prodigious distance in the past, no facts can be appealed to which render their existence less probable in Laurentian days. With a world in all respects fitted to sustain them; with our knowledge of the mutual dependence of the animal and vegetable kingdoms, and of the enormous length of time during which all forms of life have existed together without essential change in any, only one conclusion seems possible, so far as external evidence is concerned.

But if we admit this conclusion, and believe, as I think we are bound to do, that at the earliest period of which the rocks give us any record all the chief forms of life existed in the world, the general law of change in organic life is at once shown to be, not that of development from one simple form to many complex ones, but that of persistence in essential differences, with constant variation only in their associated details.

This law is in complete harmony with our experience, as far as it goes, and with every geological discovery of a positive kind. It is, of course, absolutely subversive of Haeckel's entire system, which rests upon the opposite belief; a belief

which, as far as observation concerning the past sustains it, is built up solely upon negative evidence. The worthlessness of this for this purpose is, I think, demonstrated by the facts I have brought before you, as it is undoubtedly suspected to be by Professor Huxley himself, and others among our ablest physicists, who hold fast, nevertheless, to their favourite doctrine, believing, apparently, that it can be upheld even when its original basis is cut away.

I could not, in the present Paper, attempt to examine more than one portion of Haeckel's system, and I have chosen that part which is really fundamental to the rest.

The inferences concerning blood relationship which ought to be drawn from embryology, and other lines of physiological research, are of the highest importance, but they could only be dealt with in a separate Paper.

I must, in conclusion, guard myself against any misunderstanding of the views I wish to support. To say that all the chief forms of life existed at the earliest period known to us, is neither to say that they existed from all eternity, nor to account for their actual presence in the world. It is to assert only that the evolutionist explanation of their origin fails, and must be discarded, and that Science has not yet found out how they came to be here.

How, being here, they vary in detail continually; how they adapt themselves to change of circumstance; how each in its turn has periods of rapid progress, in which the utmost capabilities of particular families are developed through many generations, and periods of retrogression, in which they degenerate, and perhaps die out; how natural selection, silently acting through all these changes, keeps the world peopled by its most vigorous inhabitants, and so insures the long perpetuation of the existing system; all this, science has discovered, or is discovering, and it is no part of my

object to detract from the splendour or depreciate the interest of these grand achievements.

It is the attempt to dogmatise where nothing is known, and to assume as established truth a doctrine concerning the origin of life which has no foundation in experience, that has to be resisted, alike in the interest of true science and of the hopes of mankind.

---

#### NOTE A.

One of the physical objections to any form of the nebular hypothesis may be stated thus:—It follows, from the laws of diffusion and fluid pressure, that, in a nebula composed of mixed gases, with or without solid matter floating in them, the several elements will distribute themselves, at any temperature, in accordance with their densities; so that the outer layer of matter in a spheroidal mass will be specifically lighter than the interior. This is recognised when the comparative lightness of Jupiter and Saturn is pointed at as confirming the theory. But the earth, on the hypothesis, was formed from the equatorial portion of the outer layer, when the diameter of the solar nebula was that of the earth's orbit. It consists, nevertheless, of heavy and light materials mixed together in vast proportions. The exterior planet, Mars, and the two interior ones, Venus and Mercury, are all, moreover, nearly of the same density as the earth, while the density of the sun is only one-fourth of this. The sun's comparative lightness may be partly explained by his high temperature, and partly by errors in estimating the size of his nucleus; but there is no indication of the existence in the sun of denser elements than those we are acquainted with, or of a higher average in the proportion of heavy matter. The densities of Jupiter and Saturn are extremely

doubtful, since we do not know the depth of their atmospheres; and the facts concerning the other planets appear irreconcilable with a nebular theory, either hot or cold.

---

### NOTE B.

#### EARTH'S ATMOSPHERE.

Total weight - - - -	5,000 billion tons.
Of which—Nitrogen =	4,000 billion tons.
Oxygen = 1,000 "	" "
Carbon = 1 "	= $3\frac{1}{3}$ billion tons [carbonic acid.]

#### ANNUAL VEGETABLE PRODUCTION.

	Per square mile.
Land surface = 50,000,000 square miles.	
Average annual growth, dry vegetable matter, left after animals feeding on growing plants have been fed ; estimate, includ- ing roots, = 3 tons per acre - - -	2,000 tons.
Of this—Carbon = one-half - - -	1,000 "
Left unconsumed by animals feeding on mature vegetation ; estimate, one-half - - -	500 "
	[carbon falling annually on the ground.]
Of this, two-thirds remains unoxidised - - -	= 300 tons.
Total annual deposit of unoxidised carbon on land surface = - - -	15,000,000,000 tons.
Water surface = 150,000,000 square miles.	
Average annual growth, dry vegetable matter = } Not " " deposit - - - - = } included.	

## VEGETABLE CARBON IN EARTH'S CRUST.

Per square mile of total  
area British Islands

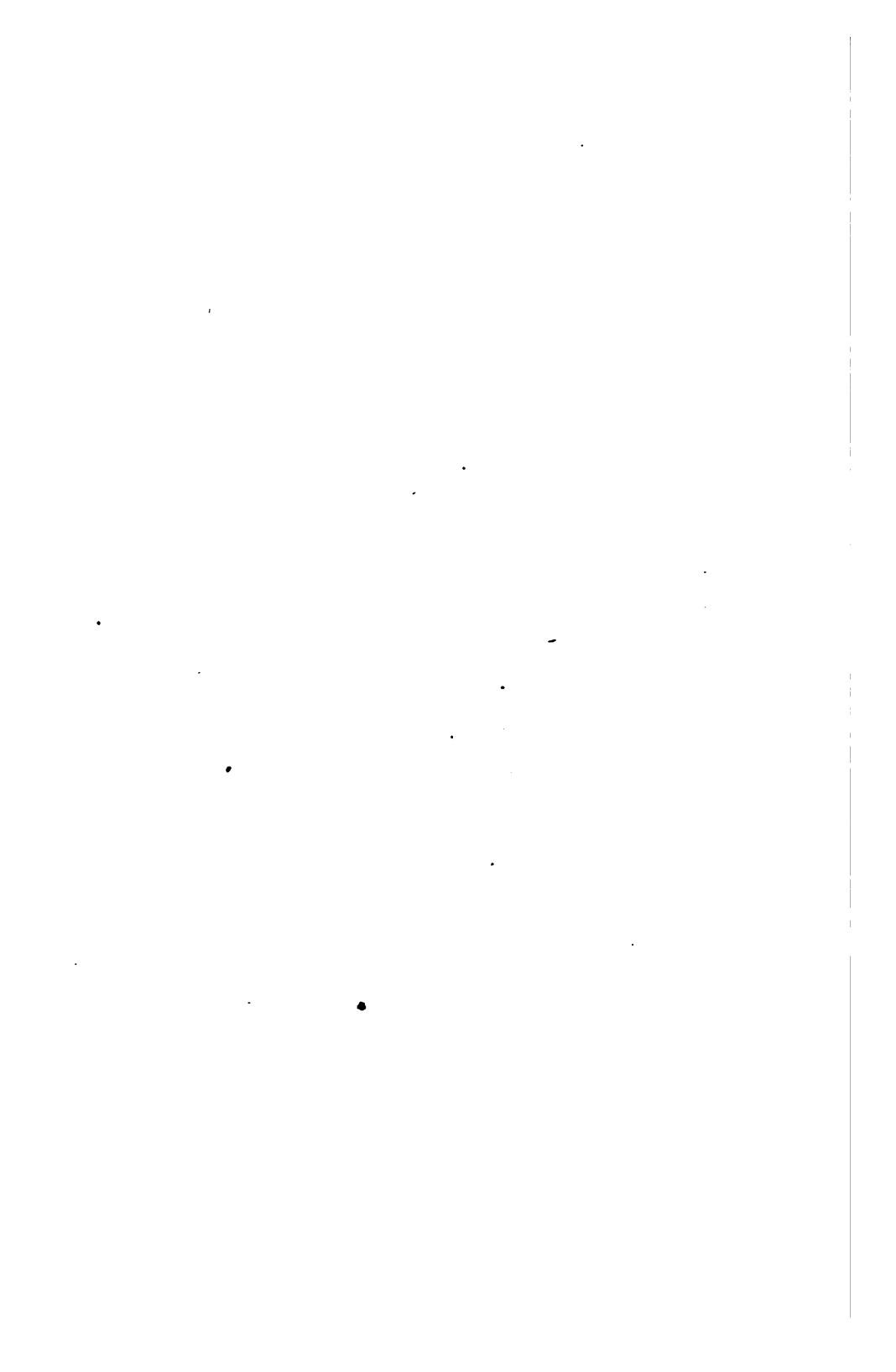
Average for British Islands, from estimate of  
coal-fields only, to a depth only of a  
mile and a half, nineteen-twentieths of  
the area being assumed to be destitute  
of carbon - - - - - 8,000,000 tons.

Earth's area = 200,000,000 square miles.

Total fuel in earth's crust, first mile and a half, at same  
average, = 600 billion tons.

On estimate of annual deposit given above, this quantity  
(600 billion tons) would be deposited in 40,000 years.

The above are all given in round numbers.



## DISCUSSION ON MR. MOTT'S PAPER.

The reading of Mr. Mott's Paper occupied the whole of the evening, and it was resolved to devote an evening to its discussion. This discussion took place on the 22nd of January, and the following are the remarks of the chief speakers.

DR. DRYSDALE.—I join heartily in the commendation which this Paper will no doubt receive on all sides, and which it deserves. The author merits the gratitude of all members for bringing before us such a resumé and original critique of one of the most important questions of the day. Apart from that, it contains also an original treatise and argument on the continuity of terrestrial, chemical, and vital processes, which is too important to remain as part of a mere critique, and which I hope will be expanded and published separately. As to the whole scope of the Paper, the best sign of appreciation is, I think, not mere panegyric, but criticism as rigid as possible. First, then, the attitude of the author towards Haeckel's unflinching pursuit of scientific reasoning to its logical conclusion. This he praises. Then immediately blames, because Haeckel excludes purpose and plan, and sees nothing but matter and force, governed by unchanging laws. Here I join issue with the author, and assert that science proper is in its right place, and has no concern with plan or purpose. If it leaves a large gap, or positively conflicts with hopes and ideas we derive from other sources than science, it is for philosophy, -or something higher, to reconcile the two. On this point one would like further explanation from the author to justify the prejudice raised against Haeckel's theory by pushing forward its

atheistic tendency, while, at the same time, he rejects the common modes of reconciling science and religion by the mere mode of stating them, as done at page 43, viz. :—“ Some, indeed, are satisfied by a simple trust in supernatural power, as able, under any circumstances, to fulfil the promise upon which Christians have so long relied ; but the keener sighted perceive that all the evidence of that promise, and all the reason for that trust, are really swept away by a theory which makes mind itself the mere passing product of the clash of atoms. Some endeavour to escape the difficulty by appealing to the indefinite possibilities lying hidden in the vast region of the unknown ; some take refuge in the idea that, while the ancestors of mankind were perishable beasts, a living soul was given to the race when a fitting bodily form had been developed.”

I, for one, am happy to say that I am not keen-sighted enough to perceive why the evidence of this promise is swept away if life and mind are the passing product of the *clash of atoms*, if that is a proper expression for the interactions of this transcendently complicated and wonderful combination known as living matter. When we see life and mind displayed more or less fully by the whole animal creation, from the elephant to the worm, only just exactly so long as this material organism is perfect, and no longer, what right have we to suppose that these faculties depend on an immaterial substance added to matter when organisation begins, and withdrawn again, or even actually perishing, when this material organisation is dissolved at what we call death ? True science acknowledges no such right, nor can it pretend to show the existence of any immaterial substance. It deals with matter and force alone. And if in “ the indefinite possibilities lying hid in the vast region of the unknown,” I am assured, on sufficient authority, that the Almighty had granted immortal life and mind to man, whose

body was developed from an ancestral race of perishable beasts, I have no difficulty in accepting the belief as consistent with the Darwinian theory, just as much as with that of direct creation of man. Haeckel's positive Atheism, or Pantheism, is wholly unwarranted as a deduction from science, even if his complete theory of evolution is right, which I by no means grant. Science, certainly, may fail to give proof of the existence of design, or show us the nature of God, but cannot disprove His existence. I was, therefore, very curious to hear what one who rejects the appeal to revelation, and even the indefinite possibilities of the unknown, would say; but, to my surprise and disappointment, I have heard nothing of the author's scheme of the universe. And, in fact, nothing but an elaborate argument to show that, as far as scientific evidence goes, "all things continue as they were in the beginning," if, indeed, there was any beginning. He guards himself by saying that he does not assert the eternity of living and other things as they are; nor explain how they came to be, if they came to be; but at the same time asserts there is no evidence that the sun, and the planets, and the earth, and all upon it, vegetables and animals, not excepting man, were ever different substantially from what they are now, or were ever non-existing, or shall ever cease to exist substantially as now. This, I think, is a theory quite as compatible with negative Atheism as Haeckel's is avowedly with positive, or Pantheism. Therefore, if the author refuses to qualify it by the more common methods, he should have told us his own method of defending it from the imputation. Haeckel's Pantheism is not a deduction from the evolution theory, nor from natural science at all; it is nothing but Spinoza's Pantheism, which was reached by purely metaphysical reasoning; and Haeckel's book is merely an attempt to show how the evolution of life may be explained consistently with it. As a matter of fact, I consider Haeckel

has entirely failed to fill up the immense gap between inorganic and the very simplest organised matter; so, practically, he has not disproved the received belief, that at some point miraculous intervention must have taken place to account for the origin of life. And as to their general tendency, his opinions and those which hold that all things may have gone on for ever as they are now, are very much on a par. So much for the general scope of the evolution theory, which is the chief part of the paper. To turn to a few details. The author admits that the old ideas of the fixity of species were entirely mistaken, and that, in a general way, the Darwinian theory is "no longer a matter of debate." But the question is, how far can one form of life change into any other, or is there any definite law as to degree or direction? This is, I apprehend, nothing more than Darwin's question which he left unanswered. Is there only one stem, or phylum, to which all species may be traced, or were there several such stems, which came into being simultaneously, or successively? The same question is further discussed by Haeckel, under the head of the monophyletic and polyphyletic origin of living beings. That is, from a single stem or phylum, or from many such. Now, we must remember that Haeckel's hypothesis supposes the formation of several or many different kinds of living matter, by primordial generation from non-living matter. Hence many stems may have no blood relationship, and thus there is a natural limit to the evolution of particular species. And also, that this question of origin from one or several stems is continually turning up in the natural history of each species. The tendency of the evolution theory is certainly to reduce the stems to as few as possible. For the present, Haeckel thinks we must at least admit a separate stem for plants and animals. But, intermediate, there exists a whole kingdom of Protista, consisting of eight classes.

And below them all a lowest living deep, called Monera. I will now read Haeckel's own words :—" If we adopt the polyphyletic descent-hypothesis, we must assume a greater or lesser number of stems or phyla, which have all originated independently by primordial generation. In that case there must have arisen numerous different kinds of Monera, whose difference must have consisted in slight chemical alterations, to us not recognisable, but on which depended their capacity for development. A small number would have been the source of the vegetable, and another small number, of the animal kingdom. While between these would still remain a portion, and develop as a kingdom, neither animal nor vegetable, *i.e.*, the Protista." He gives here a diagram showing such an origin of the three kingdoms from Monera, while a vast number of different kinds of Monera perish. Although he is inclined to the mono-phyletic theory, or the final reduction to one stem, he says the present state of knowledge does not allow the question to be decided. So we see, after all, the difference between Mr. Mott and Darwin, and even Haeckel, is only one of detail and degree. According to the first, we have no reason to suppose otherwise than that the same kind of creatures, somewhat modified, but still recognisable, ancestors of the present fishes, birds, beasts, and even men, existed in the Laurentian period, or, in fact, at the very beginning, if there was a beginning ; while the last two believe the evolution of species goes back to a far more rudimentary form of life. Of these two hypotheses, I am inclined to prefer that of Darwin and Haeckel, and if this geological evidence is negative in the one case, it is most assuredly equally so in the other. As the time is about exhausted, I shall only touch briefly on one or two points more. First, I cannot but feel surprised the author dismisses so briefly, as a mere speculation, the universally received belief of the former fluidity of the earth resting on its shape as an oblate

spheroid. He does not give a word of explanation as to how it could get that shape, except by revolving as a non-rigid body. At the same time, I believe it is now admitted by men of science that the crust of the earth has been rigid, and ceased to lose heat for a time quite as long as the Laurentian period. Likewise, it is not needful for evolution hypotheses that the surface should have had a higher heat derived from internal sources than now. Nor that there should be any excess of carbonic acid in the atmosphere. Now, Mr. Mott's original part, showing that combustion of carbon must be continually going on as one element in the balance of carbon and oxygen, is very striking, and will, no doubt, attract the attention it deserves from the scientific world.

But here we only need to notice the argument, that from the essential and complementary part taken by both animals and plants in maintaining the balance of oxygen and carbonic acid, there never could have been a time when the number and variety of the species of animals and plants could have differed materially from what now exist. It is assumed that, because perfect plants consume carbonic acid and evolve oxygen, and perfect animals do the reverse, there can have been no lower kinds of living beings which could exist and thrive without such mutual inter-dependence. But this is not the case, and we have a considerable number of species of protophyta and protozoa which can live and thrive on purely inorganic materials, viz., ammoniacal and mineral salts. Such we know now, and we can easily imagine them to have existed in a state of the world very different from what obtains now, and thus furnish a store of nutriment, alter the proportion of the gases in the atmosphere, and otherwise prepare the way for more highly developed forms of life.

The Rev. H. H. Higgins, M.A.—The most solid tribute I can pay to the merit of my friend's Paper is the admission that my attempt to answer it gives me quite enough to do, and leaves me neither time nor space for well-deserved encomium.

1. My first notice must be in the form of an unqualified protest against a statement on page 42, line 21: "In this Haeckel's argument is generally unanswerable. He shows that there is no such intermediate stopping-place as timid evolutionists are anxious to find."

I am a timid evolutionist. I shrink from the thought of that personal annihilation imposed by evolution unlimited or unconditioned. I burn to know more of nature than these eyes can see; more of that world of enchantment, music, than these ears can hear; more of loved friends, whom I can only half know now; and the thought that all this is impossible, could it be entertained, would go far to unman me. But evolution unconditioned exists only in the imagination of idolatrous theorisers—*nature knows nothing of it*; and as for a stopping-place, I do not know a single main line in evolution which does not very soon lead you where stop you must. For life has not yet been known to be evolved from lifeless matter, nor living growth from protoplasm and environments, nor human intellect from the instincts of brute animals. These breaks, at which hitherto the most adventurous theorists have been compelled to halt, or to leave "the solid ground of Nature," may well serve as stopping places for timid evolutionists.

2. Intermediate forms. The argument on pages 48–54 deals with a very important question concerning the testimony of intermediate forms. The method is briefly this.

A, B and C are three living forms, of which B is intermediate between A and C. B may, of course, stand for any number of intermediate forms, differing by small gradations. The paper contends that the existence of B does not show that A and C had a common origin, since B may have had a distinct pedigree of its own as long as that of either A or C.

This is logically unanswerable. Biologically, much may be said in reply. For the intermediateness of B, a living form, or a group of forms, may biologically have much significance or no significance at all. The deficiency in my friend's argument is owing to his having treated the question in a manner too logical and too precise. For biology is not an exact science; I might say, quite the reverse; as are also all sciences involving life and the way in which life behaves.

3. On page 48, line 23, a complaint is made that science gives no satisfactory answer to the question, "Is the tendency to vary a limited or an unlimited one?" If I take upon myself to answer in behalf of science, "The tendency to vary is limited," my friend has, I think, no resource except the further question, "Where is the limit to be drawn?" to which I may reply, "I don't know;" which, I submit, is a thoroughly scientific answer, though not, perhaps, a satisfactory one.

4. On page 52, line 28, it is stated that no individual would be exactly like his distant progenitor. This seems to be a simple statement of an unquestionable fact; but I may, nevertheless, use it as an illustration of the wide difference between practical biology and logic.

The individual in question would have two parents, four grand-parents, eight great-grand-parents, sixteen great-great-grand-parents, and at the tenth degree back no less than one thousand and twenty-four progenitors, all different. The

individual could hardly be exactly like each of these ; but—and this is the point I wish to enforce—it is quite probable that the individual might, biologically, be easily, and without any doubt, identified with each of the thousand and twenty-four progenitors, if they could all be found.

Logical and biological sameness are by no means equivalent terms.

5. Unoxidised carbon. The deeply interesting argument, occupying pp. 64–81, appears mainly to rest on a statement made by no less an authority than Bischof, p. 65, line 25 : “Of vegetable matter falling on the ground, a great part of the carbon remains there.” “On an average it may be assumed that two-thirds of the carbon falling on the ground remains there as a permanent deposit.” My reasons for thinking otherwise I will now state. My friend considers that the carbon thus deposited sinks slowly into the ground, and is there oxidised. “Carbon,” he remarks, p. 73, “like other deposits, descends ultimately to a considerable depth, and this is necessary before it can be burnt.”

I believe that it does not descend at all. Its specific gravity is less than that of earthy materials ; and if you shake up shot and mustard-seed, you will never get the mustard-seed to go to the bottom. Carbon is almost insoluble, and cannot be carried down in a state of solution. Air, though very light, descends into the earth because it follows the laws of expansion of gaseous bodies ; but carbon must behave in accordance with the laws of the specific gravity of solids.

It is true that vast accumulations of unoxidised carbon have been deposited in former ages, but our woods and forests are not producing coal now. No, if you would witness the nearest approach, in our days, to the formation

of a bed of coal, you must go, not to the luxuriant vegetation of a tropical forest, but to the humble turf-bog, where cæspitose plants, chiefly Sphagnum, the Bog-Moss, are depositing unoxidised carbon in the form of peat. How is it that the frail Sphagnum of the bog can deposit its remains for after-centuries, whilst the giant timber tree of the forest falls and is soon clean gone? It is because the mode of growth in the Bog-Moss enables it to seal, cover up, and protect its dying and dead stems and leaves, excluding those living germs, visible or all but invisible, which are the mighty agents in all animal or vegetable oxidisation.

That this is the true explanation appears also from circumstances which occur almost everywhere. Examine a pond overhung by trees, the leaves of which fall every year into the pond. At the bottom you will find black carbonaceous mud, often many feet in depth, the gathering of many years. The water has excluded the living germs. The carbon is all there at the bottom of the pond; it has not sunk into the earth.

Again, the presence of Protophyte Fungi, Bacteria, and the like, in dead vegetable matter, is not merely conjectured. Who does not know that an infusion of hay swarms with them? What is their natural course of life? Not to be put under a microscope—nothing of the kind. Let the farmer give them a chance, by permitting his hay to become damp, and they, together with various forms of Mucor, will soon show their activity.

This process of slow combustion has received the name of Eremocausis; fatty acids and dry cellulose being able longest to resist it.

As I walked in the untouched forest of Dominica, last year, I said to myself, There is no accumulation of vegetable matter here. And Why? Not because the carbon had sunk into the earth, but because there was not a leaf or a

splinter on the ground which, when examined with a powerful lens, did not show the oxidising activity of vegetable parasites, sometimes two or three deep; the blackened scar of a Pyrenomyctous Fungus, yielding in its turn to further decomposition wrought by a fungus that I could not distinctly see. Soon all that would be left of the mass of decaying vegetation in the deep forest would resemble the red clay at the bottom of the deep Atlantic, for there only would remain the incombustible ashes of the Protophyte Fungi, which had burnt up everything else. Under circumstances admitting air and moisture, instead of an annual deposit of unoxidised carbon, according to Bischof amounting to 15,000,000,000 tons, it seems probable that there would be no deposit, or a trifling one.

But how about the coal beds? Perhaps there were no Protophyte Fungi then. Far more likely it is that the coal vegetation was protected as peat is protected now by its producer the Bog-Moss. Showers of Macrospores, masses of Lepidodendroid integument; these formed the coal.

My friend thinks there has been no great change in the types of living things since the earliest period of which we know anything. Vegetation has probably changed in type since the carboniferous era. The giant plants of those days were more in affinity with the Club-Mosses and Bog-Mosses, than with the Angiosperms of the present age, and these include all our forest trees except the Fir tribe, and also by far the greatest part of the vegetation now in existence.

W. Carruthers, F.R.S., states, that in the Calciferous Sandstone, at the very base of the Carboniferous strata, occurs a true angiospermatous plant. It has also been asserted, on good authority, that a marsupial mammal occurs in the Trias. What the disciples of Haeckel have to say in this matter, I know not. Theirs is a theory which admits of no exception. A single genuine exception is as fatal to

the claim of infallibility as ten thousand. A Trias Mammal, or an all but Silurian Angiosperm, altogether dislocates Haeckel's genealogical tables; throwing back the whole of the pre-mammalian, or the pre-angiospermatous divisions, into the extreme depths of the past, and leaving little or nothing for evolution to accomplish since a period inconceivably remote.

This is not the occasion for arguments in support of a theory of development. I should be quite satisfied to have conceded a general progress, however slow or gradual. Perhaps my friend, at some less brave times, is disposed to admit that his cycles may not be perfect rings or circles, but rather, we will say, spirals. The earth is said annually to return to the *same place* in its orbit; but when the time comes round, earth, moon, sun, and orbit, are all millions of miles away on their progress. Yet, to an ordinary observer, our place looks wonderfully like where we were a year ago.

Mr. A. E. FLETCHER.—If we may take it as a fact that some of the coal or other carbonaceous masses are destined to subterraneous combustion after being buried at great depths, the thought is suggested that this generation of heat deep in the earth's crust is in accord with that other beautiful contrivance by which the sun's heat is carried down through the depths of an otherwise frozen ocean.

As is well known, water and other liquids become heavier, bulk for bulk, as they cool, so that the colder portion of a liquid is found at the bottom, and the hotter portion at the top of the mass, with a notable exception that in the case of water a maximum density is reached at the temperature of 40° Faht. The effect of this is, that if the sun shines

upon the surface of water at a temperature below 40°, the upper portion will, on being warmed, become heavier than that below, and will therefore sink, thus carrying with it the warmth received from the sun's rays, down even to the bottom of the ocean.

We may, perhaps, therefore, associate the two phenomena, as designed to carry out the same object, namely, that of conveying the heat of the sun's rays down deep into the crust of the earth, to a position it would not reach by conduction only. For the heat given out by the combustion of coal is but the heat which has been received from the sun, when under the influence of its rays the woody fibre and other vegetable structures were formed, which in time became consolidated and conserved as coal.

It must be conceded also that did a subterranean combustion take place by means of the agencies indicated by our essayist, the heat accumulated might reach a degree of intensity which we cannot easily imitate in our furnaces, for there the heat is dissipated through the walls. Here, however, imprisoned within walls of unlimited thickness, the heat would accumulate till it reached an intensity we cannot equal in the appliances at our command.

Dr. Wm. CARTER read the following extract from an article written by himself in the *Quarterly Journal of Science*, in April, 1865, showing that he concurred in Mr. Mott's position, that there was no evidence against an extensive animal and vegetable series in very ancient times.

"And yet, after having descended into the regions of an immeasurable antiquity, Geology is obliged to confess her inability to reach the beginnings of life on the earth, admitting that, for aught she can tell, as extensive an animal and

vegetable series might have existed previous to, as since, those earliest traces which she has yet discovered. For every new revelation serves but to strengthen the probability that the entire series of rocks is passing through a ceaseless cycle of change, and that granite itself may be but the extreme term of a metamorphism that, by its intensity, has obliterated all vestiges of organisms with which it might once have abounded. Certain it is that the Histiodermas and Oldhamias of the Cambrian period have lately been proved to be recent, compared with the incalculably more remote Polyzoa and Foraminifera brought to light in the lower rocks of the Laurentian series, which, in their turn, will probably be shown to be as far removed from organisms of an earlier period yet to be discovered."

MR. GEORGE H. MORTON, F.G.S., said that he differed in opinion from Mr. Mott with regard to many of the statements brought forward in his Paper, but that he would confine the few remarks he had to make to three of them. At page 44, Mr. Mott speaks of "continually putting back the date at which the earliest examples of each particular form are severally found," evidently referring to the first appearances of the classes of the vegetable and animal kingdoms in the geological formations. Mr. Morton called attention to a Paper of his own, in the *Proceedings* of the Society for 1858, in which a table is given showing the earliest records of each class in the successive formations; and stated that there does not seem to be any material difference between it and similar tables, more recently published, after the accumulated observations over a large portion of the earth's surface during the interval; indeed, it is remarkable that so long a period in the history of the science should

have produced so little alteration. So far as the Reptilia are concerned, the lowest are now referred to the Carboniferous, whereas, in 1858, the *Telerpeton Elginense* was supposed to occur in the Devonian, in strata since proved to be Triassic. Mr. Morton referred particularly to the absence of the remains of fishes in the Silurian—except in the very highest beds of that system—and expressed his belief that if they had existed during the early ages of that period, some of their remains would surely have been discovered.

Mr. Mott says (at page 45), that Haeckel shows that "in the seventy thousand feet in thickness of the Laurentian, Cambrian, and Silurian systems, a thickness which, in his belief, required many thousands of millions of years for its deposition, by far the largest portion is in that metamorphic state in which no fossil forms can be recognised." Mr. Morton admitted the correctness of the statement, so far as the Laurentian was concerned, but not with regard to the Cambrian and Silurian systems. He said, "that neither of these are metamorphosed in the typical districts of North Wales, nor in many large tracts of country in other parts of the world. There certainly are regions where such rocks are metamorphosed, but that might be said of more recent formations. The few traces of low organisms that have been observed in the mass of the Cambrian strata\* go far to prove the paucity of life and the absence of the higher classes during that period, while the splendid collections of Silurian fossils that have been obtained in England, Europe, and North America cannot be disposed of as "the few remains which have been found here and there as the sole organic records of this vast period." (Page 45.)

Lastly, Mr. Mott (at page 58) states, "The largest sedimentary deposits in the known crust of the earth owe their origin, not to mechanical, but to vital operations," which is

\* Cambrian of the Geological Survey.

the reverse of the actual fact, and it may easily be shown that the mechanically-formed rocks are by far the largest portion of the earth's crust. The Laurentian is about thirty thousand feet thick, and contains about three thousand feet of limestone, so that only one-tenth has been formed by vital agency. In the Longmynd rocks, east of Church Stretton, the Cambrian is about twenty-six thousand feet in thickness, with about ten feet of limestone near the base, only two thousand six-hundredth of the whole. The Silurian of the West of England, along the border of Wales, is about twenty-two thousand feet thick, and the united thickness of the Llandeilo, Woolhope, Wenlock, and Aymestry limestones altogether is only about three hundred feet thick; while in the Silurian of North Wales there are only the Bala Hirnant limestones, about thirty-five feet thick, so that the limestone, compared to the mechanically-formed rocks, is very insignificant. The carboniferous limestone, with an average thickness of one thousand feet, is a very important organically-formed formation; but when from six thousand to ten thousand feet of coal measures are added, the proportion of vitally-formed strata, including the coal seams, cannot exceed one-sixth of the whole carboniferous system.

Mr. T. WARD.—We have had the Paper discussed by scientific men from their various stand-points. I wish to make a few remarks as a non-scientific man.

The point which seems to me to be one of the most important in Mr. Mott's Paper is the following, on page 47:—“Animal life was as abundant and as varied in the earliest period known to us as it is at the present day; all its typical forms existed then.” To substantiate this, Mr. Mott brings forward a very ingenious and elaborate hypothesis respecting

the quantity of carbon existing in the air and the necessary interdependence of plants and animals. Mr. Mott says things must have been in past ages what he has described, and whether there is any evidence of this or not is immaterial; if facts seem to negative the conclusion, so much the worse for the facts, for the theory says such facts could not be. Now, I have always understood that geological facts show a distinct line of progressively developing forms. In all geological works with which I am acquainted this seems to be the case. There is no appearance of irregularity; we do not find in the earlier formations a larger number of highly developed forms than in a succeeding formation; then a preponderance of the lowly developed forms and an absence of the most highly developed; and again, the highly developed, and then again the very lowest forms; and so on in an uncertain and irregular order. What evidence there is points to progression from the lowly developed to the more highly developed forms. Now, on the doctrine of probabilities, is it at all likely that throughout myriads of ages, in which, according to the hypothesis, animal life, in all its typical forms, existed as plentifully as now, that the only specimens of this form of life preserved to us should show a distinct line of progression from lower to higher forms as the ages progressed? Such a species of selection would be infinitely more wonderful than Darwin's. Would it not be more logical to say, We find certain traces of life at certain periods. It is true that these represent only a small proportion of the living beings in existence at those periods; but, at all events, this proportion will fairly represent the existing beings of the time. If, then, there be absolutely no traces of certain forms of life in any of the deposits of the period, it is reasonable to conclude that such forms were not then in existence. We must draw our conclusions from the facts which are presented to us, and any hypothesis that refuses

to do so must in its nature be faulty. Negative evidence may not be able to establish "the character of the life existing at any former period," but where there is a certain amount of positive evidence as to the nature of that existing life, negative evidence, at all events, will tend to strengthen the probability of the falsity of any hypothesis that does not square with the positive evidence. Mr. Mott's hypothesis requires certain forms of life to be existing at a certain period. The only forms of life of which any traces remain do not bear out the hypothesis, and the total absence of all traces of what ought, according to the theory, to exist as plentifully as those forms of which traces remain, must surely make the hypothesis untenable.

Time will only allow me to make a few remarks on another point. On page 73, we have the remark that "Carbon, like other deposits, descends ultimately to a considerable depth, and this is necessary before it can be burnt." Now, as, according to the hypothesis, this carbon is being deposited everywhere on the surface of the earth, how does it get down to be burnt? I see no explanation in the Paper of the way it descends. If I look at the strata of the district with which I am best acquainted, which is characterised by the Trias, I see no trace of carbon from the surface-soil downwards. There is not the slightest vestige of carbonised matter. It must get down in some fashion, but how?

I have been much pleased with Mr. Mott's excellent Paper, and admire the ingenuity of the hypothesis, but, as far as I can see, it is not sufficiently conclusive to satisfy me.

MR. DAVIES said, the great deficiency of the Paper was, that it gave no hint of the manner in which the state of

things existing at the most distant known period came about. Mr. Mott's views require that there must have been a time when the crust of the earth was created, with layers of coal or carbonaceous matter at varying depths, and that in some way the lowest of these was ignited. This being given, we can conceive the possibility of the rest. But this involves just as much difficulty as the view that the various strata now existing were created as they are now—a view which probably few intelligent beings hold.

If the nebular theory be true, there must have been a time when there was no free oxygen, as carbon and oxygen, at a high temperature, must unite. No known process for elimination of oxygen in nature is known, except vegetation. On this view, vegetation must have preceded animal life; and the evidence, such as we have it, agrees with this view, which is opposed to Mr. Mott's.

There is no evidence that the accumulation of carbon, alleged by Thomson and Liebig, actually takes place on any great extent of the earth's surface. In land which has been grazed for years we find only a superficial layer of soil, containing organic matter, and below this, generally rock, sand, or clay, almost devoid. The formation of coal or peat requires conditions which are far from universal; and where these do not exist the carbon produced is practically entirely oxidised.

It is in favour of Mr. Mott's views, that during the existence of life upon the earth the mean temperature of the surface must not have exceeded about 120° F. Now, as the earth must be cooling, according to Professor Tait, ten millions of years is the utmost that can be allowed for the geologic changes since life existed. As this is not enough, there must be some means by which the cooling is compensated, and this may be that pointed out by Mr. Mott. This theory may, therefore, supplement the nebular theory, but cannot,

I think, overturn it, and therefore leaves Haeckel's views untouched in this respect.

#### MR. MOTT'S REPLY.

Confining myself to the questions in debate, but with a hearty appreciation of the friendly nature of the criticisms, my reply will be as follows.

I shall say little on the theological view of the matter. It was not my object to discuss the question whether the complete doctrine of evolution is consistent with any, or, if so, with what, theology. Haeckel himself asserts an absolute atheism to be the necessary result of his own theories. Similar views, more or less complete, are widely spread among the more advanced school of evolutionists. The reasoning on which they are founded is powerful. The difficulty of replying to it is clearly shown by the nature of the various efforts made in this direction. I have assumed that these facts are sufficiently grave to make a fresh examination of the evolution doctrine necessary. If that doctrine is itself unsound, we need not trouble ourselves further about its theological consequences. I will, however, add one or two general remarks.

No view of the material universe, however mechanical, is inconsistent with a belief in a Creator, unless it asserts the eternal existence of matter and its laws. If any beginning is believed in, a cause for that beginning has to be assumed: and if a machine, once made, will go on for an indefinite time by its own mechanism, the mechanism will never account for the machine; and purpose and plan might be as clearly proved by its construction as they could be by any subsequent interference with its movements. But purpose

and plan are forms of intelligence. If intelligence is only the passing product of the clash of atoms, *a fortiori*, this is true also of plan and purpose. If so, the material universe must exist before these can be produced, and to speak of them as concerned in calling it into existence is, of course, absurd.

If trust is reposed in any promise that is made, the only rational ground for it is the belief that the being who makes the promise possesses certain moral qualities. But to say that any being possesses moral qualities, is to say that he is an intelligent being ; and if intelligence is the product of the clash of atoms, so also must these qualities be. But the promise on which Christians have relied is made by a Being who declares himself the Creator of the universe, and not its product. If we do not believe the declaration, on what ground do we trust the promise ?

The necessity of a material organism to the action of human intelligence is a fact of observation ; but observation does not tell us why it is necessary, or how it operates. If human intelligence is the product of the clash of atoms, that is one explanation of the necessity ; but if it is the product of a spirit acting on a material form, the necessity is just as clear.

I do not offer this as a complete answer to Dr. Drysdale's remarks on this part of the question, but only as an indication of the line of thought which such an answer would follow. To be complete it would necessarily be long.

It is objected by Dr. Drysdale, that I have not given my own idea of the scheme of the universe. But my purpose was to show that Haeckel's idea of it is untenable ; not to propound another in its place. I believe that physical science has not yet discovered anything which discloses the scheme of the universe, but that, as in space, as far as we can

see, our telescopes show similar conditions of existing things, so in time, as far as we can trace the past, there is no important difference discernible between it and the present. Every one admits this concerning the more recent past; I only maintain that it is true up to the limit of our remotest knowledge.

The condition of the universe two thousand years ago did not explain the origin of living forms. I think the same concerning the Laurentian epoch. This is to leave the question of origin entirely open, as far as science is concerned. I myself have an undoubted belief in the reality of spiritual existence, as distinct from material existence; and I, of course, suppose that the true explanation of all vital phenomena is to be found in the action of spirit upon matter; not in the production of life by material agency; and when it is said that science cannot pretend to show the existence of any immaterial substance, but that it deals with matter and force alone, I cannot help pointing out to my friend what seems to me a contradiction in terms; for force, at any rate, is not matter, and yet science cannot stir a step without assuming its real existence.

The descent of existing forms of life from one stem, or from many, is a question of evidence, but it does not touch the true root of the doctrine of evolution, which has little philosophical importance if it cannot explain how a phylum came to exist at all. For, unless the movement of lifeless matter can produce a living phylum, there is some other power in the universe by which it has been produced; and if there is such a power, then there is an efficient cause for any vital phenomena always existing. If it required this extraneous power to create the first phylum, there is no reason to assume that only one would be created, or that a world, naturally suited for many forms of life, would be left

with only one form till countless ages had slowly changed this into many. Of course, all objection would vanish on proof of the fact, but the proof must be positive before it can be admitted. To ask us to believe it on mere speculation, or on grounds of negative evidence, is an error which Haeckel entirely avoids.

As to the form of the earth, the nebular theory, doubtless, gives one rational explanation of it; but it is far from being the only one. Among spheroidal objects made by man, a certain number are made in accordance with that theory; by the revolution of semi-fluid matter on an axis; but the same shape is arrived at by a vast number of methods. So, until we know as a fact that the earth was once nebulous, we have no sufficient reason for determining the cause of its shape. But, in fact, the earth is chiefly covered with water and surrounded by an atmosphere, and both air and ocean are constantly conveying material from one place to another. These two fluids necessarily tend towards a spheroidal form, and have done so ever since the earth revolved on an axis; and it appears certain that their joint action must have given this form to the solid crust in the course of ages, whatever its previous shape might be. This is Lyell's conclusion, supported by Playfair and Herschel. (*Principles*, 10th Ed., vol. 2, p. 199.)

I do not say, or believe, that "there never could have been a time when the number and variety of the species of animals and plants could have differed materially from what now exist." That would be to predicate eternity, not only of matter itself but of its present distribution. I only say, that the present condition of things existed as far back as our knowledge extends. This is fatal to the doctrine of Evolution, not only by depriving it of all evidence in its favour, but also because we see far enough back into the past to say that if the essential

differences between living forms have been permanent through that vast period of time, there can be no ground for believing that the higher forms are descendants of the lower. The true origin of these forms and of their differences remains a question which physical science is not yet able to solve. The field is open for any theory sustained by proper evidence, and not inconsistent with the actual facts; for a theory of direct creation, for example, if proof is forthcoming, and the date assigned to it is sufficiently remote.

On the question of the interdependence of plants and animals, it is necessary to observe exactly what the evolution doctrine requires. The earth's crust contains a prodigious quantity of carbon, of undoubted organic origin. If this had been derived from an atmosphere of carbonic acid, the liberated oxygen would have been many times greater in quantity than it is, or than it can ever have been while any air-breathers have existed like those of the present day. If it was derived from some other compounds of carbon, the nature of those compounds must be explained, their presence in sufficient quantity must be accounted for, and the result of their decomposition shown to be not at variance with physical facts. We mislead ourselves if we rest on the supposition that some unknown organism, living on some unknown food, could account for the carbon in the earth and the gases in the air by some method which cannot be explained. The composition of the atmosphere has certainly not been altered while the mammalia have flourished. The deposition of carbon has gone on during that period, in the usual manner, by the operation of known causes, without disturbing the general balance. What reason have we for thinking it was otherwise in the carboniferous age?

The three points referred to by Mr. Morton are of great interest, but on the second there is no great difference

between us. On the other two, I must make some remarks.

The date of the earliest insects was put back from the Carboniferous to the Devonian era in 1865. In the same year the *Eozoon Canadense* was announced in the Laurentian. Mr. Morton's suggestion that there were no fishes in the earlier Silurian era, because none have been found below the very highest beds, is one of those inferences to which I am obliged to give an unqualified opposition. Our knowledge of the conditions of Silurian seas is totally insufficient to enable us to say whether fishes would or would not be likely to be preserved as fossils in those small portions of deposit which have been examined. I must dissent also from the theory that the results of vital action can be measured by the amount of limestone in any series of beds. Silicon, magnesium, iron, phosphorus, sulphur, potassium and sodium, are found in nearly all organisms; and most other elements are occasionally present. And that deposits due to vital agency are perpetually falling over the entire ocean bed, is a fact admitting of demonstration. The mineral matter which flows day and night into the sea in solution is certainly deposited, and it requires vital agency to extract it from the water. The quantity brought in this way from the land is, on a low estimate, equal to several cubic miles of rock every year, and the total quantity dissolved by the sea itself is probably still greater; for waves are dashing always on every coast, stirring up the mud, grinding the pebbles, devouring the cliffs, and of course dissolving whatever is soluble all the time; and the material brought in mechanical suspension by rivers, is subjected in the sea to the same action as it slowly subsides; and the sea is constantly provided with fresh carbonic acid, which increases its power as a solvent, not only by the rainfall on the ocean itself, but from the living bodies of marine animals. The vast quantity of

matter thus dissolved is all precipitated again, for the ocean does not grow saturated, and this is all due to vital action. A total deposit of ten cubic miles a year from this source, which is probably less than the truth, would fill up all the existing oceans in less than fifty million years. If geologists dispute this reasoning, they must explain how the dissolved material is got rid of after reaching the sea.

Mr. Ward repeats the usual statements as to the geological succession of progressive forms. I will ask him to consider the following facts :—

According to Lyell—

It cannot be said that the successive development of higher and more complex structures is by any means conspicuous in that grand branch of the animal kingdom (the Mollusca) which is most largely represented in a fossil state. The history of Fish imparts an idea of mutation rather than of progression. The Reptiles have long been retrograding. (*Principles*, vol. 2, chap. 9.) These are the chief forms of animal life of which geology gives any lengthened and continuous history. I will add, that if we search the cretaceous rocks, we find no mammals, but if we go back to the Oolite, their remains are discovered. The highest animals are found only in recent rocks; but it is only in recent rocks that the places where their bones are deposited at death can, except by rare accident, be preserved.

It is very satisfactory to me to find my friend, Mr. Higgins, admitting that my reasoning as to intermediate forms is logically unanswerable. Zoologically, however, he thinks that much may be said in reply. For "the differences or affinities of living things cannot be treated as you would treat terms in a syllogism." I fully admit this. The work of the actual observer has a special authority of its own, so far as it really goes. But I think that in the use of the

phrase, "differences or affinities," my friend shows how strongly the observer may be unconsciously affected by the habits of thought around him. For what you really observe is not difference or affinity; it is difference or likeness. The word affinity means more than this, while nothing more than this comes under your observation. You do not see the derivation of forms; you only see how far they resemble each other. Now, when two living individuals are extremely like each other, we know that one of two things is true; either they are the offspring of the same parent, or else their parents also were very like each other. If we know nothing more, the probability in favour of the second alternative is of course millions to one. The likeness between the parents also is often a little less, and is not by any necessity a little greater; so that no retrospective view will make the fact of likeness real evidence of anything further. Doubtless there are cases where a group of facts produces in us a strong conviction that a particular kind of animal, not now existing, must have been the ancestor of an existing species, as in the case of the Hipparion and the Horse. But in such a case the zoological observation which establishes the likeness and the peculiar nature of the difference, is not the real evidence of derivation; that, if found at all, is found in other circumstances. If it is proved that the Hipparion lived formerly, and does not live now; that the Horse, living now, did not live formerly; that at the era of the Hipparion there was no other living thing that could be the ancestor of the Horse, and that at the present time there is nothing but the Horse that could be descended from the Hipparion—and if similar facts are proved concerning the intermediate forms of progressive change—then, indeed, the proof is conclusive; but it rests, in such a case, on these external facts, and not on the zoologist's special knowledge.

In stating that no individual is exactly like his distant

progenitor, I do not overlook the fact that the "progenitors" are in each case not one, but many. But what is true of one is true of all; and the zoological "identification" of one individual with another means the observation of likeness between them, simply and solely.

On the question of the deposit of carbon in the ground, I will add some further explanation. I have estimated the annual deposit as equal to three hundred tons of carbon per square mile, or half a ton per acre. Where, then, is this to be found? This half ton per acre is washed every year by at least five thousand times its own weight of rain. Of course the greater part of it is washed away into water-courses; it floats into rivers, and thence into the sea, and there becomes deposited along all the coast lines in the world. Most vegetable matter sinks in water after it has become saturated and partially decomposed. The continental coast lines exceed one hundred thousand miles in length, and the breadth of river deposit round them may be taken at two hundred and fifty miles. There is, therefore, a marine area of twenty-five million square miles, equal to half the land surface, on which the carbon brought by rivers becomes spread. Generally, it is mixed with mud, of which it forms but a small percentage, but in many marshy estuaries it is caught by growing vegetation, and collected in large quantities. This coast line, therefore, receives the great carboniferous deposit of the age. It is a ribbon-like band, following in all directions the continental outline, with frequent patches of large accumulation, occurring all over the world.

Another large portion of the carbon falling on the surface is washed, not into rivers, but into all low-lying and hollow places in the land, where it accumulates, in deep patches of vegetable mould, over limited areas; and another portion remains spread over the surface generally. If the latter were

one-fourth of the whole deposit, it would add about an inch to the surface soil in a thousand years; and though in many large districts no such addition can have occurred, I do not think this can be said of the world at large. The surface soil is subject to very frequent disturbance, and is re-laid by nature continually, and the portions removed from time to time become deposited afresh in modes too various to be traced. Wind is another agent by which large quantities of vegetable matter are constantly being removed from the place in which they fall and driven together into masses.

Considering the vast area of the ocean deposit, and the great number and frequent thickness of vegetable accumulations on land, it seems to me that the estimate I have made is at least sufficiently accounted for.

There appears to be a little misunderstanding about the descent of carbon into the crust of the earth. Like other deposited material, it descends only in the ordinary course of geological change. That it has thus gone down in prodigious quantities, and in all known epochs, is an established fact. In the work on Coal and Coal Mining, by Mr. Warrington Smyth, F.R.S. (3rd Ed., 1873, p. 21), a single page gives a table of the position of beds of fossil fuel known to exist, showing their presence in every group of rocks from the Pliocene to the Silurian. Nor is there any reduction in the scale on which such deposits have been formed in recent times; there are tertiary lignites in Austria with seams of brown coal more than one hundred feet in thickness. (Smyth p. 85.) And fossil fuel, in the ordinary sense, is probably only a small part of the actual carbonaceous deposit. Coal is only formed when great masses of vegetable matter are brought together with little mixture of anything else. When mixed up with other mud, as on the greater part of the coast line, the beds ultimately formed will not be beds of coal, but ordinary rocks impregnated with carbonaceous matter, such

as bituminous limestones, and innumerable shales. The production of a true coal bed requires a combination of special circumstances by which unmixed vegetable matter can accumulate in the same place through long periods of time, and can then be carried down by gradual subsidence to a considerable depth. The mode in which this can happen will alter from age to age, the chief modifying circumstances being the geographical and climatal conditions of the period. At present the places where such accumulation appears to be going on, are principally peat mosses and the deltas of some rivers. But vegetable matter diffused through ordinary rock, though not combustible in that condition, may easily become so. At a sufficient temperature it will yield petroleum by partial decomposition, and the liquid hydrocarbon, filtering through in the earth's crust, will collect together, and will then be as available as a bed of coal for subterranean combustion.

The quantity of vegetable matter oxidised on the surface, by the action of the lowest organisms, cannot be accurately determined, but there are manifest limits beyond which it cannot go. The necessary oxygen must be provided. It does not appear that Bacteria or Fungi can provide it by the decomposition of water. The oxygen in the vegetable matter itself is only sufficient for the combustion of a small part of the carbon, and that of the atmosphere is only available where it has free access. But the greater part of the fallen vegetable matter is soon washed out of contact with the air, and its complete oxidation becomes then impossible by the agency in question. Dominica, to which Mr. Higgins refers, is, I believe, a small hilly island with plenty of streams, and is, therefore, one of the least likely places for vegetable accumulation.

In the above observations I have already replied in part

to the remarks of Mr. Davies, who, however, is still disposed to favour the idea that there was once no free oxygen in the air, and that its subsequent liberation, as well as the deposit of carbon in the crust of the earth, were due to the action of plants which existed before animals, and decomposed the atmospheric carbonic acid. I think this view is rendered improbable in the highest degree by a consideration of the actual quantities. The carbon now in the ground could not have been thus deposited without liberating a quantity of oxygen enormously greater than the quantity now existing in the air. If the figures I have given are carefully examined, it will be seen that in all probability the actual quantity would be many times as great as the entire atmosphere. The hypothesis, therefore, cannot be admitted till we have some rational explanation of the mode by which this surplus oxygen could be removed.

It must also be remembered that all known organisms, plant or animal, require more or less oxygen in order to live, and that if they do not get it from the atmosphere, or from air dissolved in water, it has to be supplied by separation from compound substances to which they have access and which they are able to decompose.

I will add, in conclusion, that while I cannot claim the direct support of Sir Charles Lyell for the general theory of my Paper, the views laid down in the *Principles of Geology*, chapters 11 and 27, are in harmony with a considerable part of it, and are fundamental to the rest.



## ON SOME PHASES OF MODERN FRENCH THOUGHT.

By J. BIRKBECK NEVINS, M.D.

DURING a recent visit to the South of France, I picked up sundry books at the railway stalls, and was interested in some cases, and surprised in others, at the indications they gave of tones of thought which I had not anticipated. The fact of these books being found on the railway stalls seemed to indicate that the sentiments they expressed were also more or less popular; for not only were there authors to write them, but purchasers for them when written, and these sufficiently numerous to meet the approbation of such caterers for the popular taste as railway stall-keepers. It may be that these forms of French thought will be more familiar to the members of this Society than they were to myself; but if this should be the case, we shall still, I trust, have the subsequent discussion, which often proves even more interesting than the paper which has given rise to it.

The works I have alluded to illustrate both peasant and fashionable thought, either of which alone would be an imperfect representative of national feeling. They are entitled "Contes Merveilleux," or, traditional fairy tales, current among the peasantry on the borders of the Lake of Geneva; "Les Petites Misères de la Vie Conjugal," by Balzac; and "La Confession," by Jules Janin. I shall commence with the first, and give a slight outline of one of its most thoroughly rustic stories, which is, on that account, one of the best illustrations of peasant thought. The story is entitled "Pommes de Pin."

"At the season when fir-cones cover the soil of the forest, Corasan went every morning, *by order of his*

mother, to gather a large sackful. He would willingly have dispensed with this work, for he was a strong fellow for his age (he was about twenty-five years old), but he always obeyed—for, *in this country, a man does not think himself relieved from filial submission as soon as he has a beard to his chin.*"

Now an English writer of romances for the artisan class would never think of beginning his story with such an introduction as this. But the tale proceeds to relate that one day, as he made his accustomed collection of fir-apples, he exclaimed to himself, "Oh! if some good fairy would change them into gold." He had scarcely uttered his wish, when a fairy appeared, and said that it should be granted the moment he reached home, if only he did not think one single bad thought between the forest and his house, and he should have six days to try in.

He was delighted with the promise, and returned home at night full of anticipations; but, alas! the cones rolled out of his sack cones still, with no sign of gold about them; a disappointment which the fairy explained the following day, by telling him that as he went past his landlord's house he had said to himself, "Ah! my fine fellow, for as grand as you think yourself, I shall be grander than you soon." The next day brought a similar disappointment; and this time the fairy charged him with having put a few cones into his pockets, and with having said to himself, "When the fir-apples are changed into gold, I shall have some for myself, which I need not divide with my brothers and sisters." Another day he failed from having said to himself, when passing the hut of a poor man almost bed-ridden with rheumatism, that he ought to be ashamed of himself for having it in such a dirty state. And the last misadventure arose from his turning aside up a by-path in the forest, to avoid meeting a poor girl called Colombelle, and saying to

himself, " My mother forbade me to think about Colombelle, and I ought to obey my mother." " You hypocrite ! " said the fairy, " when your real thought was that in future she would not be good enough for you, as she was too poor now you were going to be so rich." The unfortunate sinner, with tears in his eyes, acknowledged his fault, and begged the fairy to leave him as poor as at first, if only, " Oh ! good fairy, you will make my mother give me Colombelle for my wife," to which humble petition the fairy answered, " Go home in peace, and when you have emptied your sack, go down upon your knees to your mother for this favour." And the story ends with a picture of the poor *méchant* upon his knees, entreating his mother to give him Colombelle for his wife, and, while in this attitude, hearing the sound of heavy balls rolling about on the floor, for his fir-cones had all been changed into gold, which he shared equally with all his brothers and sisters, reserving no more to himself than he gave to each of them.

We cannot conceive an English writer constructing a story upon such a basis. Obedience rendered to a mother, unwillingly it is true, but still as a complete matter of course, by a sturdy young fellow of twenty-five, and its being a self-evident fault to wish to be richer than his brothers and sisters, even as the result of his own work. The equal division of family substance is known to be the LAW in France, but I had not realised that the principle was so engrained in the French popular mind as it appears to be from this story. In conversation with a French friend, who has occupied a distinguished position in France, and is also well acquainted with English society, he expressed his conviction that it was the still remaining tie of family life, which was the one hope of safety in French political and social life. And, at the recent Social Science Congress, the author of the paper on the improvement of the land

laws dwelt strongly on the influence of the division of the land among the family, in creating an immense number of small proprietors, each interested in the welfare of France, and in making his own little plot of land as productive as possible. The universal thrift and industry, thus kept active, have produced the universal savings among the peasant population in the country which have always been ready to supply a Government loan, and have contributed to that spectacle of French resurrection which has astonished the world.

The prayer of the poor peasant to his mother, to procure him his wife, has its echo in the more fashionable circles depicted by Balzac and Janin, the latter of whom briefly says that his hero, having tried many times on his own account to find a wife, but without success, at length entrusted the search to his mother, in these brief words, "Anatole remitted to his mother the choice of a spouse. This is, indeed, an office for a mother. It needs a woman to understand a woman, and a mother is seldom deceived."

The principles and process of selection, according to modern French ideas, are more fully developed by Balzac, who gives the following as the orthodox plan :—

A friend speaks to you of a young person, good family, well brought up, pretty, and having 300,000 francs, and your wish to be introduced to this charming object results in the following conversation : "A charming evening," you say. "Oh, yes, sir," she replies—and you are admitted to court this young person after the following preliminaries have been duly discussed by the two families :—

The gentleman's family see in the charming young person—

1st—A young lady, and,

2nd—An only daughter, who will therefore inherit—what ? Something from her mother, and something from her father.

FROM HER MOTHER—who ought certainly to inherit something from a gouty old uncle, whom she coddles and flatters, &c., and also from her own father. Caroline, our heroine's name, also flatters and pets her uncle, and her chances upon the whole may be reckoned at—well—say 200,000 francs.

The respective mothers-in-law compare notes, and agree that there is no probability of further little Carolines, and the gentleman receives permission from his mother. "You may marry Caroline, for she is sole heiress to her mother, her uncle, and her grandfather."

HER EXPECTATIONS FROM HER FATHER are, that her grandfather is an old man in his dotage, and therefore the succession cannot be disputed, and may be reckoned at 300,000 francs. Her father is a fairly preserved man, but as he made some havoc of his constitution when young, he cannot wear for ever, and his only sister is an invalid, and will soon be translated from earth. Caroline is therefore an eligible partner, and the gentleman's mother allows him to court her.

On the other hand, the gentleman himself will, "some day or other," inherit from his father—so much; so she also is allowed to accept his addresses. Meanwhile the two families have had a little delicacy in discussing money matters, but they are eventually settled by two notaries, and "then," according to our author, "the two families think it necessary to invite you to go before the Maire and to Church"—as if it was an idle and unnecessary formality—to be succeeded by the wedding ball, at which both bride and bridegroom are present until the dawn of the following day. I shall spare you the description of the ball and its accompaniments, merely observing that the account given of it leaves us nothing to regret in our English fashion, which sends the newly-married couple on a wedding tour, and leaves the ball to be enjoyed by others while they are far away.

But the sequel of this wedding ball is the point upon which the interest of the most earnest and interesting of these volumes turns throughout. The bridegroom, under circumstances partly natural, and partly of the most extravagant unnaturalness, according to our English ideas, accidentally strangles his bride the first night. No suspicion attaches to him, except in some obscurely-hinted manner by a tall, stern man, who comes to view the body, apparently from the police. But it is necessary now to give a slight sketch of the hero of the book, who is called Anatole, which I do in the words of the author. "His family was rich, and, in this age of equality, was proud of a great name, without any one being able to mock at it for its pride." "Like nearly all the old families of France, it had the consciousness of its weakness and of the vanity of regrets, but still it carefully preserved these vain regrets as if they were an ornament." "Anatole was a man of the new world—simple and good, thoughtful and ambitious. By his tastes, his habits, his profound work, and his advanced intelligence and little leaning to enthusiasm, he belonged entirely to the new generation—a young and strong party in the political world, which is in haste to live and to learn, because it has a confused perception that there is need for it, that everything around it is dying, and that one ought to live quickly to be soon replaced, like a transition people."

"Society is now so constituted that there is only one life, viz., the political life, for a man of large thoughts. Everything else is forbidden to him under pain of ennui and mortal disgust. There is no room for emotions or interest—the purple of empire has lost its charms, the general's uniform inspires no ardour, and only merchant vessels crowd our ports; the profession of a savant is impossible, for intelligence advances every day to a frightful equality. There are no more ambitions of l'Eil-de-Bœuf, or animated intrigues of Versailles, to distract us. The time for being young has

passed away." "Now political life does not commence before forty, and there exists, therefore, between the two conditions of youth and of being a citizen, twenty years of waiting and study, during which one can hope for no other recreation than marriage. Anatole therefore consented to take a wife. His parents wished it, though, for himself, he did not see the necessity for it. But, however, jokes about husbands are worn out, and no one is now afraid of them." So he married, as we have seen, with the melancholy catastrophe already mentioned, and "his future was destroyed, the world was desert, he would henceforth be alone, and he would give all, all for one single hour of repose, which always fled from him." A painful description then follows of his vain attempts to obtain freedom from remorse, and he often thought of giving himself up to justice, but the disgrace it would bring upon his family, not apparently any particular shrinking from death itself, deterred him. He became, however, so impressed with the idea, that he constantly attended executions, for he said, "Am I not like that miserable wretch, except that he pays his debt and is quits with justice? He pays for his crime, body for body, while I am a coward and a liar."

After long and vain attempts to obtain rest, he "is at length driven by the force of his sufferings to abandon himself to thoughts which are not born of earth;" and here the principal interest of the work appears to me really to commence—exhibiting feelings which I had little idea would find so prominent a place in a railway-stall shilling book. "It was at first a vague and confused religious idea, a mere caprice; then it gradually became a necessity, and, in spite of himself, he began to find that he was straining forward to this last hope for calm and repose."

"At first he recalled the faith of his earliest years, so lively and pure, and his infantile joy when, at the first silvery sound of the bell, he set out for the village church on Sun-

day, so proud of giving his arm to his grandmother. That day always had an air of festival and calm; all the women wore their best dresses, and the men had on new clothes. To reach the church it was necessary to cross the churchyard, a little field sown with poppies and wooden crosses. He must pass through the crowd to reach his chosen place in the choir, and in the choir he knelt by his grandmother, and prayed with her in a loud voice. Then, when the religious chants were sung, he prayed aloud and sang like the others, but he sang with the women, and his infant voice accorded well with theirs. Then arrived the pastor, preceded by the Swiss with his innocent halbert, and then came the last adieu of the priest, after which the whole crowd dispersed in silence; and there were cries of joy when they had passed beyond the cemetery, each inhabitant standing at his door with a pleasant look and a cordial salute; and the old sacristan offered the holy water to the guests before the meal, and the evening passed in country dances. He recalled the smallest features of these fairy times, and you may think with what regrets."

"One night, when he had been more distressed than usual, he found himself gazing for an hour upon an ivory crucifix, which had been a present from his mother, and as he dwelt upon the crown of thorns and the drooping head, he felt too miserable for longer shame, and he determined upon what he had long irresolutely wished—to repent like a Christian. He rose from bed, and, wrapped in his dressing-gown, aroused his wondering valet, and desired him to make all haste in calling for M. l'Abbé Paul. 'If he sleeps, wake him; if he says he will come to-morrow, beg him to come this very instant; if he asks who sends for him, say it is I; and if he does not wish to come till the morning, tell him that some poor fellow is dying, and he will come, he will come quickly.'

"Anatole had met the Abbé Paul in society, and had

loved him from the first. His whole person commanded confidence—grave without austerity, learned without pedantry, polished without insipidity, his mouth was full of wise and good words, and his heart was full of charity. Various stories were abroad about his wild and violent youth."

"He had been one of the bravest soldiers in the French wars, and he had become a Christian for the love of repose, and a priest from philosophy; thus he fulfilled the first laws of the priesthood—to see much, to suffer much, to know much, and lastly to pray much."

"Anatole had a moment of hesitation after having despatched his messenger, and accused himself of feebleness while figuring himself as a penitent before the priest, whom he had hitherto known merely as a companion. To confess himself! He! a man of the nineteenth century. He! to say to a priest that he had sinned, and to accept his punishment with fervour. He had often seen, during his vagabond courses, poor women on their knees on the stones round the tribunal of penitence, waiting with clasped hands for their turn to come; and he had remarked their subdued joy and light step in leaving the church, but never had he thought that it would come to him to ask those unhappy women for a place by their side; never had he imagined that he would go to place himself at that wooden grating which separates the penitent from the confessor; and yet what a difference was there between him and these good women, between his crime and what they had to tell."

"His nurse, for example—so good, and so gentle and patient—this woman who had brought seven children into the world, of whom five had been killed in battle, and who now worked all alone in order to support her aged husband—this good nurse, who had worked all her life as no beast of burden works, and who had never refused to open her door to a man pressed with hunger—what has she done, that I should

come to dispute with her for a place where she would be astonished to see me? What can she have to tell her judge? What crime had she committed? And if she has reason for coming to the confessional, if she finds some benefit from resorting to it, why then should not I—I, so miserable—who so little resemble her?"

While this conflict was passing through his mind, the Abbé arrived. With an embarrassed air, "What do you wish?" said he. "How can I be so happy that you have need for me? What can I do for you? Speak, sir, and make use of me—I am entirely at your service." "Alas," replied Anatole, "I have so many things to say that I do not know how to commence. If you knew how I have suffered this night! I imagined that by seeing you I should be solaced. Pardon me, I pray, such a sad indiscretion—pardon me as you would pardon a sick man struck with death." The Abbé was dumb. Was this the same young man whom he had seen in society, so loved, so honoured, with such a future before him? Anatole understood him, and replied sorrowfully, "It is I indeed who have called you this night, who wish to see you; yes, you, my Father, who wishes to seek from you pardon from heaven, who wishes to confess to you, my Father; it is the same Anatole whom you have seen so proud of his knowledge and of his wit. See me, and listen to what I am going to reveal." "You at my feet!" cried the Abbé, and his voice trembled and his knees shook. "You! treating me as a priest. You! depositing in my bosom the secrets of your life. Stay, stay! How do you know if I am worthy of your confidence? How do you know if I am able to receive your secrets? In the name of heaven, hear me, and know what I am—be calm." "I am calm," replied he, "and wish to confess to you a great crime, in order that that may happen which our religion wishes, for I am a Christian like you, and

I have a right to your prayers, and a right to your blessing." "Anatole," replied the Abbé, "I wish to know if you speak to a man or to a priest; the man is perhaps worthy of your confidence, and you shall have my counsels as a friend"— "I do not want a friend," interrupted Anatole; "I want a confessor. It is not you, sir, whom I have called, it is the priest, and the priest only, with power to liberate in heaven those whom he frees on earth; the priest with pardon from on high; I desire the benediction of a priest, the pardon of a priest, the penance of a priest, for my crime is great, and there is need of great power to pardon me." At these words the Abbé stood confounded, but, after a few moments' silence, said, "You see me as unhappy as yourself, for what you demand of me is impossible. Pardon me—me, who have never known fear—your confession terrifies me, and I tremble to bear so heavy a burden. Once more, I am only an honest man, nothing more than a friend. I could weep with you, and pray with you, but to lay hands upon you, and become your judge; to pronounce your sentence in this world and the other, no! no! no! my God, the task is beyond my conscience and my strength. No, I am not invested with a character so sacred as to dare to sustain, 'face to face,' the terrible avowal that you would make; I am not a priest for you; on my soul, sir, I have not the right."

"It is just as I thought from the first," said Anatole, with a bitter laugh. "I well knew that your black robe was all trumpery, and that the remedies for remorse which Christianity promises do not exist, and are only an empty lie. I am obliged, sir, for your not wishing to lie to me." "In this case," said the Abbé, "you may believe me that they are not vain remedies; for myself they have cured me of my life as a soldier; but the deeper the wound the more skilful should be the physician, and I do not think myself skilled enough to cure you.

I am still too much of a man—a man such as I was before—to be only a priest; you want a priest, young man; seek for him. To-day priests are rare. Priests are born, not made. Seek a priest, and confess your crime to him ; but to such a man a heart of steel is necessary, a hand of iron which may press upon you, an inflexible voice which may crush you. You talk of a confession. Ah ! believe me, that in all the acts of our life, to make a confession, or to receive one, is the most difficult. It is necessary to be either less than a man or more than a man ; wait still longer. Perhaps you have not yet suffered enough to be sufficiently patient. Wait, and you will find a confessor when the time shall come.” And the Abbé left the house full of tears and of regrets, for he had now learnt to comprehend how little he had attained to the height of his priestly office and of his painful duties.

“Surely,” thought Anatole, after this first refusal, “there must be among so many clergy some man strong enough to hear me, and to absolve me ;” and he hoped yet to find him. In former times it had been a subject of lively interest to him to enquire what is the depth and secret of the Catholic priesthood. He sought to know by what law the Roman clergy guides itself, beaten by so many tempests, exiled and wandering without asylum through Christian Europe, to return at length in the midst of beliefs broken up, to return alone, without help from Rome, having lost its property, one of its former ornaments, and having no more influence than a retired veteran admitted to some retreat.

“The singular position of the Clergy is a thing well worthy of remark. On one hand, the venerable relics of the French clergy, as unfortunate as royalty itself when it was banished,—these old priests, born to gold and purple, kings in their cathedrals, men of devout and gentle life, martyrs escaped from massacre, and returning at length in the train of the

king,—to these there remain only peace and sleep ; they are no more than a memory among the clergy of France. But, on the other hand, and opposed to these old clergy of proud and noble origin, a young clergy rises up in our day, without cohesion, without family, and holding no social position—poor distracted devils, who seek the Sorbonne on leaving St. Sulpice, and who find philosophers and profane orators in the Sorbonne, and not a thesis to maintain—who ask, ‘Which among us is rich?’ and remain beaten down in a common silence. But when they mount the holy pulpit they find that the word escapes in the pulpit. There are no longer sarcasms against the faith—the air of philosophy has ceased—men are ashamed to mock a priest; they have become citizens like ourselves, citizens though priests, and, thus afflicted, they have become the means of reconquering so many lost privileges !”

During his search for a confessor, Anatole found himself near the door of a vast cathedral, and noticed with pleasure how little he was by the side of the least of its doors, or the smallest of its stone-carved saints ; and he thought that if he could but enter there, and go out after being blessed, perhaps he should find repose and happiness. But, meanwhile, the various acts of the daily drama, called life, passed on. An infant lately born was carried by its nurse ; its father waits to inscribe its name in the municipal office, but there the course of the newly-born stopped. It was carried to the Maire, and it repassed the Church without entering it.

There was a fashionable marriage, and the coachman in white gloves, and the parents, and the bride and bridegroom went to the Maire. At his door they found all the poor who, of old, besieged the door of the church ; and they also returned in front of the church, but without entering it. Death itself disdained the old refuge, and the prayers over the coffin, and the holy water sprinkled over the black cloth

watered with tears. The bier was carried silently, and silently followed by the friends of the departed, who inscribed his name with the Maire ; but his body passed in front of the church, and did not stay there.

This was what the young man saw, and he could not comprehend the strange duel between the religious and the civil law. He asked in vain from what cause the power, which at first was all on one side, had passed entirely to the other, and how it came to pass that no one desired to make use of a monument so beautiful, so grand, so ancient, and so holy, in order to go with the crowd to the abode of the Maire, in a vulgar house, without perfume, and without memories.

By chance one day there was a religious procession from a church, and one bearer did not arrive. The priest was in despair, when Anatole hesitatingly offered his services, which were gladly accepted. At the close of the ceremony he observed the meditation of the pastor, his clasped hands, his eyes modestly raised to heaven, and his benediction of the people. "If only this man could hear me," thought he. "If he could bless me—all alone. If only my remorse would afterwards sleep." But this time also the unfortunate man was not heard. The ceremony was scarcely finished when a choir boy came to say that the Curé was ready to hear him, and he went away, staring with all his eyes at the Monsieur who wished to confess. The sacristy was all in disorder, and the Curé was putting away the vestments and silver cross. "Oh ! heaven," thought Anatole, "my confessor so tranquil when on the point of hearing so great a crime ; to pass so quickly from the pious ceremony to his vulgar cares, and from these to me a sinner, who calls him, and who prays. Me ! a murderer, to have to wait so long for a word, a consolation, a penance. What importance can he then attach to confession !" Anatole felt his present coolness when compared with his manifest anxiety when a bearer was wanted for his

procession, and thought, "Perhaps he despises me now that I wish to confess." He remained for some time in anxiety difficult to express, and was then told that Monsieur le Curé had gone home to dinner, and he must come next day.

He now resolved to seek a Confessor in every rank and degree of the clergy, from "the Cardinal clothed in purple, a Christian prince and a profane philosopher, to the simple village curate, humble and poor, who hides himself, and lives retired and modestly, as useful often as a sister of charity." But he found no confessor among them all. Some appeared to him to be wanting in faith, and others in intelligence, so that in this state of mental disquiet, from which he could not escape, he began to draw the conclusion that the Catholic faith was feeble and worn out—that old age, which has given the death-blow to so many religions, and so many empires, had laid its iron hand upon our religious beliefs, and that its faith was a vain and ridiculous faith, for which one could only blush. But the unhappy man checked these mournful thoughts in his soul. He had too much need of religion not to believe, and not to desire a belief at whatever price. At length he heard of a Spanish Abbé, of extraordinary reputation and difficulty of access. After adventures which may be passed over, he at length discovered him in seclusion (for he was a political refugee also) in an attic chamber, to which by chance he was preceded by a young woman, who had also gone to confess. By concealing himself in a manner which his conscience told him was not strictly honourable, but which his overpowering desire to know the mystery of confession led him to adopt, he heard the girl's confession, which might have been uttered on the house top. But some chord was struck in the priest's bosom, for she was a Spaniard, a fellow-country woman, and evidently an old acquaintance; and when she ceased, there was a long silence, and the priest essayed to speak, but the words died on his lips. At length he

uttered, "Go—go, for I am too great a sinner to hear you. Your sufferings are mine. Go—go, or I die. Go far hence ; the suffering is too great." And she prepared to depart, with her eyes bathed in tears. Before she left, however, he gave her the address of one, "who," said he, "is stronger than I ; whose name is followed with trembling among the faithful ; a holy priest, inexorable and cruel, and who is never deceived ; the greatest Confessor in the Roman Church. Take him this letter. Perhaps he may refuse you, seeing you are only a young woman, for his moments are precious, and he reserves himself for great crimes ; but then fall at his feet, and tell him your grief, and perhaps he may deign to lend an ear to your prayers."

Surely this was the priest Anatole was in search of, and he hastened to request his aid. It happened that this night he slept tranquilly for the first time since his nuptials, and when, on awaking, he saw a tall stern man by his bedside, he asked the meaning of his presence. " You sent for me," was the reply ; " I come at your desire." But Anatole, suspecting the nature of his call, said that he felt so much better that he would not trouble him further ; and, with the greatest politeness, implied that he should decline to confess. Then his visitor sternly demanded whether he did not remember having seen him before, and Anatole, in terror, recognised the supposed police inspector of the dead body of his unhappy bride. He then plainly told the young man that he had his choice of confessing to the Maire or to the Priest, of being denounced as a murderer or treated as a penitent ; and the narrative, which I have thus attempted to bring before you, ends as follows :—" The confession was long and painful. He had at last found a confessor—a man strong enough to dominate over his whole being. Soul, intelligence, heart and mind, all were submitted to this man ; and when he departed, Anatole was still in the

same place on his knees, with clasped hands, eyes dry and haggard, prostrate and confounded."

"After this incident he was in confinement for some months, but now he is better, and his most intimate friends scarcely recognise him; calm, self-possessed, cheerful withal, smiling, happy without show, his head partially shaved, and a fresh innocence around his face. He prays, he sings, he sleeps; he is a happy man, at peace with himself and with others. He is a priest."

Such is the picture put before us of the thoughts and actions of a man moving in modern fashionable Parisian society; and the following narrative of peasant life also has impressed me deeply, from the picture it gives of family affection, of cheerful, unmurmuring fortitude in bearing privation, of the mixed sentiments of ambition and the desire for spiritual blessing with which the peasant mother desires that her son should become a priest; of the ignorance of evil in which he is educated, and his consequent innocence, but at the same time his ignorance of how to resist temptation with its consequent overwhelming effect, when he is first exposed to it, and the bitter and unsparing punishment with which his weakness is visited. The picture, in short, that it gives of peasant religion in France at the present time impressed me strongly, and I should feel that this sketch of modern French thought was incomplete, if this, as well as the previous narrative, was not put before you.

THE STORY OF THE FRENCH PEASANT PRIEST, FROM  
"LA CONFESSION," BY JULES JANIN.

Our hero, during his rambles, came to a river which he wished to cross by a ferry boat.

"The boatwoman, tall and stout, with large arms and coarse hands, a dark face and white teeth, was seated in the stern of the ferry-boat.

"I cannot take you across at present," said she, "for the 'Angelus' will sound in a quarter-of-an-hour, and my little Jean, who rows instead of his father, has gone for my dinner, and I am alone, and am waiting for the noon passengers.' 'Well, my good woman,' said Anatole, 'I will wait for the 'Angelus,' and your little Jean. Do you love your little Jean very much?'

"Oh! sir, my little Jean is a man for me. He is not ten years old, and he does instead of his father. He works and sings to please me. He rises the first of anybody in the morning, and lies down the last at night, after having sung all day. Without our Jean, my husband and I should have died with hunger this winter, with the vexation about our other son.

"Then you have another son? Pray, why does he give you so much vexation?"

"Alas," replied the boatwoman, "it is a history. My oldest son was a priest, monsieur, but is one no longer, and we don't know what to do now."

"And how did that happen?" said the young man. "Pray tell me, for I am interested to the last degree."

"It was pride that destroyed us, sir. You see the little white house by the willow tree. We inherited that house and five acres of good land, and we should have been rich with that, but I had the idea of making a Curé of my Ambrose. I wished to have a son who would be saluted when he walked out, who would dine at the castle, and would say the mass. We have sold that pretty house and those five acres of land, to enable our boy to study. He read all the books, and was already shaved, and was going to be a vicar somewhere, when a great misfortune happened to him, poor boy. For you see, monsieur, I cannot believe that he was a criminal. He was a young man, both brave and proud; but he had never been proud before his father,

and he always dined with me in his holidays. Oh! you wretched black-robe! what harm you have done us," and the poor woman was bathed in tears.

"The autumn passed, and the fishing had been good; the fair had made our ferry profitable, so that we had saved, my husband and my little Jean and I, twelve crowns! all good silver! 'Wife,' said my poor man to me one evening—and that evening the wind blew, and the river foamed, and the yellow leaves beat against our windows—'Wife,' said he, 'see these twelve good crowns, which will help us to pass the winter, what shall we do with them?'

"Jean did not answer, no more did I, for we had employed that money in our thoughts, my son and I. 'Perhaps,' replied my man, seeing that I did not answer, 'perhaps we should do well to buy a pig from our neighbour; the little one would suit us, it is fat and ready to kill; and, at least for this winter, we shall have some comfort in our food, and not the miserable nourishment of last winter. Not that I speak for myself, wife, but for you and our little Jean, who is growing, and requires to eat a little meat every day.'

"The last reason made me feel bad, for my youngest boy had suffered so much, that I had nothing to say in reply to his father; but our Jean answered immediately—

"'Father, don't buy the pig; I am strong enough without eating meat; everybody says that I am as big as you. I know very well, if you don't mind, what you should do with our twelve crowns.'

"'Well,' said my man, 'what then, if it is only to put us a little at ease—to buy a new waistcoat for you, my child, for you are nearly naked, and some sabots for your mother, and a little eau-de-vie for me, to warm me when I am fishing up to the knees in water?'

"I did not dare to reply to the reasons of my poor man, but Jean came to my help.

“ ‘Father,’ said he, getting up, ‘my dear brother is a priest, and he has no black gown, nor hat with three corners. It is necessary to buy him a three-cornered hat and a black gown. We will eat stale bread again this winter, and my mother will patch up my jacket.’

“ Oh!—but my Jean was a fine boy, speaking thus, monsieur—but I kept on crying.

“ ‘Son,’ said the father, I have nothing to refuse you except the black gown. These twelve crowns shall be for you and your mother and me. Your brother is well fed, and well warmed; he has a bed and blankets, and as much covering as he wants. We lie on straw, covered by our summer clothes. He only fasts forty days—we fast all the year—and on Sundays we are glad to dine as he does on a fast day. Don’t speak to me about this gown and hat; don’t speak to me. I don’t choose it.’

“ Alas, said I to our man, he must have the gown and hat to be a priest. Just this one sacrifice more, my good man,—just this winter to pass. Would you rather have a bit of bacon in the corner of your chimney, than your son seated higher than the singers in the church, and giving you his blessing ?

“ ‘Yes, father,’ said Jean, ‘everybody despises my brother, and asks him where his gown is. He must have a gown, father. Give him the twelve crowns.’

“ The father answers. ‘If I give these twelve crowns it will be our death, Jean—take them. I give them to you, not to your brother. Your brother has ruined us; we have sold your uncle Robin’s vineyard for him, and my brother Richard’s house and vineyard, and all our fortune has gone to the seminary. You will see, my son, that I shall have to sell my nets and my boat.’ Then he turned to me, ‘Wife, wife, perhaps we shall have a priest at our death bed.’ And then he took the twelve crowns from his mattress and counted

them one by one. He sighed when he came to the eleventh and stopped at the twelfth.

"‘Jean,’ said he, ‘here is a crown for you. I want to spend it for you, Jean; you must buy for yourself some butter-cakes, and some sugar-plums, and some prunes, and some barley-sugar, and a knife with a cork-screw, and all sorts of good things. Your brother’s toys are much more expensive, my child. Go, take this crown, that it may not be said that you are the only one who has never cost us money. My sweet Jean, that your brother may not blush deeply, let us go, my son, to the fête; you shall dance, and you shall give two sous for the quadrille.’ And my poor man took his son in his arms and wetted him with tears, holding his last crown all the time.

“Oh ! monsieur, but it costs dear to make a priest. They say to the parents, ‘It will cost you nothing,’ but every moment you must be paying something. You must give your poor money to a man who does not even say ‘thank you !’ and one lives on bread, and must leave one’s boats leaky, taking in water ;” and the poor woman left one of her oars to bale out the water from the bottom of the boat.

At the same moment little Jean ran up and brought his mother’s dinner ; the poor child was naked-footed and in rags, with a tattered man’s hat on his head, and his eyes covered by hair, which he pushed off from time to time.

“Jean !” said the good woman, “while I am eating, tell the gentleman the history of our Abbé, your brother, and don’t cry any more, my son, it makes me too ill.”

Jean put his hat on the ground, and having pushed up his hair, said, “My poor brother has told me this story three times, monsieur. He was tempted by the devil one day, when he had gained enough money to go and order his cassock. For my brother gained money, monsieur ; he said masses and funeral masses, and he has often given me

money and clothes. It was he that gave me the shoes I have at home, and this hat that you see. He's very good to us, is my brother!" And this heroic lie was told with grand sang-froid by this child, who looked at his mother with a beseeching eye, for fear of being contradicted. "Well, then," continued Jean, "this is what I know about this misfortune. My brother had never gone out of the seminary. He had never walked through the streets of Paris full of iniquity—he was pure and innocent. My brother, the day he went to order his robes, took twelve crowns of silver, and went to the house of the woman who made sacred robes for the seminary; he knocked at the door, and a young girl came to open it.

"When my brother, who is for all that a tonsured Abbé, saw that the old woman was not there, but there was a young woman instead, he wanted to go back, but he did not dare; so he went in—the unfortunate fellow. When she said to him, 'Come in, please, Monsieur l'Abbé!' Then she said to my brother, 'What do you wish for, Monsieur l'Abbé?' 'I want a robe, Miss,' said he. 'What kind of robe, Monsieur l'Abbé?' said she—for she always said 'Monsieur l'Abbé.' 'I want a robe,' said he, 'for nine crowns,' for he kept two crowns for a hat, turned up with violet silk, to be presented. 'For nine crowns?' said the petite. 'You can't have a fine cloth, a good moiré ribband, a very fine neck band and full breeches. You can scarcely get a small cloak fit for a funeral. However, you can be properly dressed enough at that price; it is only necessary for us to know what you want for it to be done.' 'But,' replied my brother, 'How do they make the priests' robes for nine crowns then?' 'I understand,' said the petite; 'but then your robe ought to be fashionable, that it may show your leg, and that the cord round your waist may show your height. Something like my waistband. Look at me.' My brother, who had not

yet lifted his eyes, lifted them up. Bad luck to it! And he has sworn to me, monsieur, that this little dressmaker was all shining with fire; he could see no waistband; he only saw an infernal head. His hands were burning hot, and the girl went on. ‘Sir,’ said she, ‘your girdle will show that,’ and she put a finger upon his heart, as heavy as the finger of the devil. She stood so for about two minutes, looking at my brother all the time, and then my brother was completely dazed. He staggered, and tried to support himself, and did support himself, but he did not know upon what; but he felt under his two hands the waistband of the robe-maker who had spoken to him, and he saw no more. It was a miracle of the spirit of darkness—a phantom. My poor brother thought he was dying. The young girl forgot the sacred robes. She did not speak to my brother, and he did not speak to her. He felt his feet nailed to the ground, and he would have been there still if the old robe-maker had not entered the room, and the charm was broken. My brother, who thought he was possessed, returned to the seminary, thinking no more of his robe than if he had had two; and the next day the Superior sent away my poor brother, without bread, without a home, and without even knowing a trade. My father did not wish to see my brother. My brother is now without employment, as if it was never Sunday. They say that he is good for nothing, and his robe has not been used since that time; his robe so well made; his cord so well placed.

“Here the poor child wept, and the mother shed tears; the Angelus sounded, the labourers’ wives filled the ferry-boat, and it moved away across the river.”

I have thus ventured to lay before you some phases of modern French thought, which I was not myself prepared to find on beginning the works here summarised; and if I

should venture to specify those features which have most impressed me, they would be the remarkable family unity which they illustrate in peasant life, and the calculating, unloving preliminaries for marriage in fashionable life. The tone in which the author speaks of the revival of religious longings in his hero, when in long-enduring sorrow; the respectful searching after the secret of the mysterious revival of power in the priesthood in modern times; the remarkable manner in which the office of a confessor is described as a subject of terror or indifference to its possessor, and the effect attributed to it upon the hero—a man painted evidently to the best of the author's ability, as the type of a fashionable Frenchman of the nineteenth century; and all this set forth in popular novels on various ordinary French railway book-stalls.

## TYPE-FOUNDERS AND TYPE-FOUNDED.

By JOSIAH MARPLES.

THE art of Printing is of so general and constant an interest to all in these days, that it has occurred to me the cognate art of Type-Founding may possess sufficient reflected interest to make it worth while for us to spend a little time upon it.

In the early ages of printing, a list of type-founders would simply be a list of printers, as each printer cut his own punches and cast his own type. I therefore propose to mention only a few of such names as are connected with the improvement of the art.

The original method of printing seems to have been from wooden blocks, engraved with the necessary words or letters cut in relief, and though this admitted of a freedom of design which cast types do not permit, its great cost was soon found to be prohibitory, and some simpler and less expensive method had to be sought.

The first effort at improvement was still in the same direction, and consisted in engraving blocks, or metal plates, with letters *sunk* in them, so as to print in white letters on a black ground. I have here a facsimile of a page from a book printed from such plates, the *Biblia Pauperum*, or *Bible of the Poor*; a catechism of the Bible, consisting of forty leaves, of a small folio size. Copies of this book are very scarce, so much so that one of them has been sold for upwards of £250. The date attributed to this book is 1480. But a brighter light was about to shine, and some six years later movable types were first invented and used, and from this time the invention of printing is usually dated.

I do not propose to enter into the controversy—never to be ended—as to who was the first inventor of printing types, further than to say that, from the records of the Court of Strasbourg, it would appear that in 1439 a trial took place between John Gutenberg and his partners, in which evidence was given that Gutenberg was the original inventor of movable types, and as this was within three years after the invention, it constitutes very strong proof that he was entitled to the honour. Gutenberg, however, if the inventor of the process, does not appear to have been a type-founder himself, as he and his partner, Faust, employed one Peter Schœffer, who, “being very expert in preparing the moulds and casting types,” received the usual mediæval reward, the hand of his master’s daughter and a share in the business. The special feature of Schœffer’s improvement was, that he made metal matrices, and so was able to cast types much more readily than before. This would imply—for we are left to conjecture upon the subject—that the first mode of casting was simply such as is now adopted in an iron-foundry, that a model was cut and moulds made from it, into which metal was run, or else that the types were cut upon cast bodies, as described hereafter. Schœffer may, therefore, be fairly entitled to the name of the Father of Type-founding.

The first important book printed after the invention of movable types—cut, not cast—was the Bible, known, from the Cardinal in whose library the first copy of it was found, as the Mazarin Bible. It contained 687 leaves, and was executed between 1450 and 1455, and it was not till 1462 that any work was issued by Gutenberg from cast types. By 1474 the ordinary roman type was introduced, and began to compete for public favour with the old black letter which we usually associate with early printed books; though the latter did not give place to the intruder without a severe and long-continued struggle.

About the same time we may date the foundation of type foundries, for we find that the types cast by two brothers, named Spira, who were printers at Venice, had obtained such repute, that printers at Rome and elsewhere advertised that they used Venetian types ; the Spiras must therefore have cast types not only for their own use, but for sale to others.

In the same year (1474) Hebrew types were used, and in 1489 we find the first mention of Greek types. In 1471, indeed, an eminent goldsmith, who introduced printing into Florence, having cut punches, cast types, and printed his first book, put at the end, "Nothing is too hard for a Florentine genius." He then goes on to state that some Greek sentences appearing in the manuscript he had undertaken to print, he had left blank spaces for them, not that he had no Greek letters, but that "as many Greek scholars preferred to write their own quotations, he had thought it best to leave them spaces for the purpose." Inventing a good excuse, at any rate, does not seem to have been too hard for this "Florentine genius."

About 1474, Caxton introduced printing into England, the second edition of the *Book of Chesse* being considered his earliest production. Mr. Vincent Figgins, to whose nephew I am indebted for a copy of his imitation of this book, and whose skill as a practical type-founder entitles his opinion to great weight, believes that this book was not printed from types such as we have seen were cast by Schœffer, but from those which were cast with solid faces, upon which was cut with the graver each letter separately. To this he attributes the facts, that in the original book no pure style of letter is used, but a mixture between the old black and the letter used in manuscript books called "Secretary"; that no two letters are exactly alike; and that frequent use is made of logotypes, or types having two or more letters in combination, and contractions.

After Caxton's death, in 1491, Wynkyn de Worde succeeded to his business, and one of his earliest works was to cut sets of punches and cast types of great beauty and regularity. These types appear to have been used by all the printers of the day, and it is not impossible that the punches are still in existence, as in 1772, at the death of Mr. James, the last of the old type-founders, Mr. Rowe Mores purchased his plant, with a view of obtaining possession of these, with other curiosities of the trade. Wynkyn de Worde was the first to introduce roman type into England, and it is probable that to the great regularity and evenness of his type we owe our early emancipation from the nightmare of black letter. Pynson, another of Caxton's pupils, started in business for himself about 1493, and he also cut a new fount of roman type.

In 1496, Theobaldus, or as he was usually styled, "Aldus" Manutius, whose name is familiar to us in the "Aldine" series of books, invented italic types; and he appears to have been the first type-founder who endeavoured to protect himself by patent, as he obtained a privilege from three Popes, securing to him the sole use of this style of type for fifteen years.

In 1514, a book was printed in Arabic, in Italy, though, in 1517, a work by Dr. Wakefield, chaplain to Henry VIII., printed by Wynkyn de Worde, contained only rudely-cut Hebrew and Arabic types.

The first account of the different sizes of types that I find, is that Pynson, in 1496, was possessed of founts of double pica, great primer, and long primer, I presume in black letter, as he is also said to have possessed an english, and a long primer roman; and, in 1499, he had a pica roman, which "stood well in line."

From 1510 to 1561, Claude Garamond flourished in Paris. His types were of such repute that it is said printers

throughout Europe took care to state, as a recommendation of their books, that they were printed in Garamond's small roman.

For many years the practice was almost universal that each printer of any note acted as his own founder; but we find that, by 1637, the business of letter-founders appears to have been entirely separated from that of printers, as in that year Archbishop Laud obtained an order of the Star Chamber to limit the number of printers to twenty, and that of type-founders to four, and heavy penalties were to be levied upon any one exercising either trade without proper license. If anything could have made this regulation palatable it would surely have been the position of the licensers, who were the Archbishop of Canterbury, or the Bishop of London, and six other High Commissioners. To this order was added what would be a formidable rule now-a-days, that the four licensed founders should employ all the journeymen founders always, adding another clause which would be acceptable to the trades unionists of the present day, that none should be employed in a foundry but freemen of the trade and apprentices, except for "breaking off," as it is technically called, and for this one boy was allowed. In this connection I may mention, that in one foundry with which I am acquainted, at least fifty boys used to be employed in "breaking off." These limitations existed, having been renewed by successive Parliaments, till 1692.

#### MODERN TYPE-FOUNDERS.

I think we may now dismiss the printers and type-founders of olden times; but, before describing the practical part of type-founders' work, a few anecdotes of the early days of the present foundries will, I venture to hope, be interesting.

The *Coryphaeus* of modern type-founding, as he is called

by the Rev. Rowe Mores, the most enthusiastic historian the art has ever had, William Caslon I., was born in that part of the village of Hales Owen which is situated in Shropshire, in 1692 ; he went up to London, and was apprenticed to an engraver of gun barrels and locks, a trade which he afterwards commenced on his own account ; he distinguished himself by a skill and dexterity which were conspicuous, and which caused him to be sought for other purposes, amongst which the making of tools for bookbinders is the one of most interest to us.

In the early part of last century the type-founder's art appears to have been at so low an ebb in England that the best types were imported from Holland, and we learn that the classic works of the reign of Queen Anne were printed with Dutch types. It is not improbable that this state of things arose from the annoyances to which the law subjected type-founders, which kept men of mind and talent out of the trade, and thus did not permit any high state of perfection to be attained. Be this as it may, the fact is before us. The remedy for this state of things appears to have been discerned by Mr. Watts, an eminent printer, who having had occasion to use some of the bookbinders' tools cut by Caslon, discovered in them sufficient indications of talent to lead him to think the time had arrived for the resuscitation of the art with which he was more immediately connected. By the promise of active support he endeavoured to induce Mr. Caslon to start a type-foundry, and in 1720 the Society for the Promotion of Christian Knowledge, anxious to print a New Testament and Psalter in Arabic, engaged Mr. Caslon to cut the punches for it. When the specimen was issued, Mr. Caslon cut his name in roman, to put at the foot of the page. The form of the roman type was so good, that Mr. Palmer, another eminent printer, asked Mr. Caslon to cut the whole fount, which, when complete, excelled the productions

of any of the existing foundries. Up to this time, Mr. Caslon appears only to have cut punches, but his success with these was so great, that Mr. Bowyer, Mr. Bettenham, and Mr. Watts lent him £500 to start with, and he applied himself to his new business with such assiduity that in a very few years he had driven the Dutch types out of the field—nay, he even exported types to the continent. He erected a foundry at the rear of his residence, in the fine open neighbourhood of Finsbury-square, and when he removed to a “country house,” in Bethnal-green, his late abode was added to the foundry, which still exists and flourishes. Here, once a month, on the Thursday nearest full moon,—that his guests might have the benefit of the moonlight for their walk home,—Mr. Caslon, who was musical, and had an organ in a large room, which he called his concert-room, held a musical evening. Catches and songs of Purcell and other masters were sung, and about twelve o'clock his friends retired, having first been refreshed with a bottle of wine or some good ale of Mr. Caslon's own brewing.

His son, William Caslon II., succeeded to, improved, and extended the business left to him by his father, whose partner he had been, but, dying without a will, the business descended to his wife and two sons, William and Henry, under the superintendence of the elder.

William Caslon III. does not appear to have been very energetic in its management, however, as few new founts were added between the death of his father, in 1778, and his own retirement from the firm in 1793, when he disposed of his share to his mother and his sister-in-law, Mrs. Henry Caslon —his brother having died in 1788. The fortunes of the foundry had by this time sunk to a low ebb, and the efforts of the two women—though both extraordinary ones—were unable to withstand the active competition which was by this time springing up around them. On the death of old Mrs. Caslon, however, Mrs. Henry Caslon bought her share in the

business, and took into partnership Mr. Catherwood. The business tact and energy of the new firm, who at once commenced to cut many new founts of great beauty, soon had their reward, and before the death of the two partners, in 1808, the foundry had completely recovered its fame. Mrs. Caslon's son Henry, and Mr. Catherwood's brother continued the business, and, by great efforts in designing and cutting new founts, kept the foundry up to its new fame. Mr. Henry Caslon's son, who combined the names of Henry and William, succeeded to his father, and, since his death, a few years ago, the business has been carried on under the firm of H. W. Caslon & Co., and, in the hands of its present enterprising managing partner, Mr. T. W. Smith, who has been connected with it for nearly twenty years, it bids fair to sustain the *éclat* of the Chiswell-street foundry. I have described the fortunes of the Caslon family at some length, as it was to its teaching that all the other founders owe their success.

In 1783, William Jackson, an apprentice to William Caslon I., seems to have been diligent in his business, but no steps were taken to teach him the art—then, as now, generally kept secret—of punch-cutting. By cutting a hole in the wainscot, and watching closely, however, he soon obtained an idea how to go to work, and ere long he succeeded in finishing a punch, but on exhibiting it to his masters, with some pardonable pride and expectation of praise, he was astonished to receive a severe blow, and a threat that if ever he attempted such a thing again he would be sent to Bridewell. His mother bought him the necessary tools, and encouraged him to perfect himself in the art at home, remaining still at the foundry to learn all he could. He continued to work for Messrs. Caslon after his indentures were completed, till, during some dispute with the workmen, in which he and a fellow-apprentice, Mr. Cotterill, were thought to be ringleaders, they were discharged. Jackson entered the navy as an

armourer, and by 1763 he had £40 to receive as prize-money. He then, with three others, started a foundry, of which he was the active manager. He carried this on with great success till his death, in 1792, by which time his foundry had become one of the most complete in existence. Amongst other founts that he produced was the one with which Macklin's Bible was commenced, and which was cut specially for this magnificent work, said to be one of the finest ever produced.

About this fount a curious fact is stated. The types were not cast of such hard metal as is now used, and by the time the book of Deuteronomy was reached, Mr. Bensley, who printed it, wished to renew the fount. Mr. Jackson, however, was dead, and as Mr. Bensley did not care to purchase a new fount from his successor, he applied to Mr. Vincent Figgins, who had been an apprentice, and for some years foreman, to Mr. Jackson, to cut him a facsimile of the fount, which he did.

At Mr. Jackson's death his foundry was purchased by William Caslon III., who, we have seen, sold his share in the Chiswell-street foundry to his mother and sister-in-law; he seems to have devoted much more attention to this than to his paternal foundry, for he enriched it with a variety of what are technically called flowers, borders, and ornaments. Mr. Caslon suffered from cataract in both eyes, and, for some years, was totally blind. He was, however, operated on three times, and at last his fortitude was rewarded by the success of the operation, and he was able to see his numerous friends. His son, William Caslon IV., succeeded to his business. He is noted as having invented a method of casting types much larger than was possible up to that time, making matrices, which he called "Sanspareil," without punches. I will explain this later on. In 1819 he disposed of his business to Messrs. Blake, Garnett & Co., of Sheffield, whose suc-

cessors, Messrs. Stephenson, Blake & Co., have found it necessary to open a warehouse in London. In their enterprising hands the reputation gained by Mr. Caslon has been maintained and extended. While they do not neglect book and newspaper founts, this firm, in my opinion, excel all others in the beauty and variety of their ornamental or display types and ornaments.

Mr. Vincent Figgins, whose name I mentioned just now in connection with the cutting of a fount for Macklin's Bible, being unwilling, upon the death of Mr. Jackson, to pay the amount demanded for the purchase of the foundry, of which he had had the sole management for some years previously, was induced by Mr. Nichols, an eminent printer, and others—amongst them the delegates of the Oxford University Press, for whom Mr. Jackson had in hand a fount of Greek at the time of his death, and who suggested that, as Mr. Figgins had had charge of it, he should take the order in hand and execute it himself—to start in business for himself, and, by his skill and untiring industry, he established a large foundry, which is now carried on by his grand-nephew, Mr. James Figgins, Jun., (whose father, the junior member of the old firm of V. & J. Figgins, was recently M.P. for Shrewsbury) in a style well calculated to sustain and to enhance the reputation of the founder.

The only other founders of note in the present day are Messrs. Reed & Fox, of London, and Messrs Miller & Richard, of Edinburgh. Mr. Cotterill, who had worked for William Caslon II., with Mr. Jackson, and who was discharged with him, continued to work with him till the death of the latter, when he commenced a foundry for himself, and produced new founts with great energy. Besides cutting some small sizes, he produced letters of the then unprecedented size of two inches deep—what he would say to see our walls now, when a single letter not unfrequently occupies two sheets

of paper, each 40 by 30 inches, I cannot imagine. At his death, an apprentice of his, Mr. Thorne, carried on the business, which was afterwards purchased by Mr. Thorogood, and then by Mr. Besley, who, coming to London from his birth-place, Exeter, in 1816, when twenty-two years old, was taken into the service of Mr. Thorogood, and afterwards admitted into partnership. On Mr. Thorogood's retirement, Mr. Besley remained at the head of the concern, which was carried on under the style of R. Besley & Co. Subsequently Mr. Fox entered the firm. Mr. Besley, who was Lord Mayor of London in 1869-70, died in December last, in his 83rd year. Some years before his death he disposed of his share in the foundry to Mr. (now Sir) Charles Reed, the eminent chairman of the London School Board, a worthy son of a worthy father, the noble-hearted Dr. Reed. While these pages are going through the press, I see announced the death of Mr. Fox, on the 15th January, 1877.

Of the Edinburgh foundry of Messrs Miller & Richard, it is unnecessary to say more than that, though of comparatively modern origin, it has succeeded in obtaining the patronage of many of the daily newspapers, a fitting reward for the great care displayed in the workmanship of their productions.

Having now run rapidly over the history of the principal existing English foundries, I come to the more technical part of my paper, that of explaining the detail of the manufacture of type.

The first task a founder has is to decide the style of letter he will cut, and in this there is room for the exercise of great taste and judgment, for if the design of the type is not such as commends itself to the eye of the printer, all the founder's work will be thrown away.

The design and size of the type having been decided upon, the punch-cutter is brought into requisition. I may mention

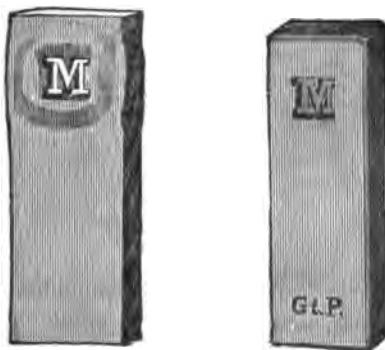
here that punch-cutting is a trade in which there are very few adepts. Nearly every foundry of any note has been established by a punch-cutter; and the late Mr. Vincent Figgins has left on record, that when his father commenced business, one of his principal difficulties was to find the punch-cutter previously employed by Mr. Jackson, his predecessor, for his visits were usually paid to the foundry by stealth, and he was popularly known by the sobriquet of the "black man."



The punch-cutter having been found, he, with patient labour, cuts out each letter on a separate punch of softened steel. Many a time does he take a proof of it by smoking it in a candle, and taking an impression of it on paper, and as frequently does he see, with the aid of a powerful glass, some shade of improvement that may be made, some little corner to be rounded off, or some round to be made sharper, until, at last, it is pronounced correct by his employer, if he be a servant, or passed as the embodiment of his taste, if he be a principal. That this task is not a light one may be judged from the fact that a single punch is often a fair day's work, while on some punches of ornamental letters many days are expended.

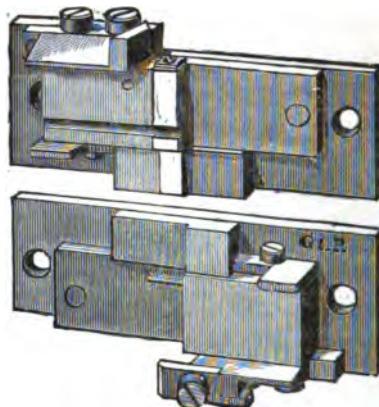
There are in a complete fount of roman and italic letters, such, for instance, as our volume of *Proceedings* is printed with, no fewer than three hundred and sixty punches required, and when to the cost of cutting them is added that of the succeeding processes, it will be evident that it is not a small matter for a founder to undertake to get up a new fount of book-letter.

The finished punch is now taken to the hardener, whose duty it is to heat it to the required temperature, and then plunge it in cold water, after which he has to temper it with gentle heat to keep it from cracking when struck—a fate, however, which it does not always escape, for should there be the slightest flaw in the rolling of the steel, its succeeding course of treatment is eminently qualified to develop it. The hardened and tempered punch is now handed to the justifier, who strikes or drives it into a piece of copper of a selected size and thickness, and it is then his task to make this



"strike" or "drive" into a finished matrix, and he has to so trim and shape it, that when it is put into the mould to be cast from, the types produced from it shall be even in line, in uprightness, in height, and in width to the types cast from all its fellows, that is, that all the three hundred and sixty matrices shall, upon simply being placed in the mould, produce types which shall look and be regular in every way. As the matrix, in its early stage of a "drive," is merely struck in hap-hazard, so to say, and as, in the foundry with which I am more intimately acquainted, the instruments used to complete it are such as will measure to the five-thousandth part of an inch, it will be evident that this is no light or unimportant part of the work. The tools used by the firm to which I allude, in this branch of

the business, are exceedingly interesting, but they are of course not such as can be shown here. A tool, for instance, which will enable a man to cut unerringly, say  $2^{\circ}$  or  $3^{\circ}$ , as they are called, but which are really  $\frac{1}{500}$  or  $\frac{1}{600}$  of an inch, from the side of a matrix, is, I take it, a marvel of accurate workmanship.



The mould in which, in conjunction with the matrix, the type is cast, next claims our attention. It is made of hardened steel, in two parts, fitting accurately together. For convenience we will examine a "hand" mould, and describe the method of casting by it, though the use of the machine which is its lineal descendant has now almost entirely superseded hand-casting. Each half of it is fixed to a wood cover, to protect the hands of the casters. When the two halves, which are made to fit into each other, and to cast wider or narrower types of the same body,—the width being determined by that of the matrix put into it,—are placed together, the matrix is inserted and kept loosely attached by a piece of string; it is then, by a strong spring, pressed close to the mould, and the latter being held firmly closed in the left hand, a small ladleful of molten metal is taken from the metal-pot, placed at a convenient height over

a furnace, and poured into the mouth of the mould, which is immediately jerked upwards. This motion serves to throw the metal into the matrix, so as to give a firm, solid face to the type. In this it is assisted by what is called the "break," a superfluous piece of metal which is cast in the mouth of the mould, and which, by its weight, helps to fill up the body of the type cleanly and squarely. The whole ladleful often does not contain more metal, however, than would fill a teaspoon belonging to a doll's tea-service. The spring holding the matrix is now loosened, the mould opened, and the type thrown out. This process is repeated as many as six hundred to eight hundred times in an hour, according to the size of the type.

For some letters of larger size, and having very fine lines, however, a different method of casting had to be adopted, the ladle being superseded by a small pump fixed in the metal-pot, to the nozzle of which the mouth of the mould is held, still with the left hand, while the handle of the pump is jerked downward with the right. This forces the metal with considerable strength into the mould and matrix, and gives a better surface, but the metal is not nearly so solid as by ordinary hand-casting. The gentlemen of the pump indulge in what is a necessary to them, though a luxury to most of us—they wear gloves at their work. The pump sometimes forces metal out through the interstices of the moulds, and a supply of left-hand gloves (not of the best French kid) is kept in stock for their benefit.

From this pump-casting has been developed the modern type-casting machine, an illustration of which is given on the following page. In this the opening and closing of the mould, the advancement of it to the nipple of the pump, the jerking of the pump-handle, and the taking off the break, are done automatically. The matrix, as in the hand-mould, is held in its place by the spring, and, on the return of the mould from

the nipple of the pump, it opens and throws down a type, with break already removed, at the rate of perhaps one hundred to one hundred and twenty per minute.



When the type leaves the mould, it is by no means ready for the printer. Carefully and exactly as the moulds are made, they cannot cast the types without a burr or roughness at the edge, and this must be removed, and the foot of the type must be made perfectly square.

The types are first conveyed to the rubbers, who pass them up and down a stone or broad file, and so remove the burr. Some letters, such as the f, a portion of which overhangs the body at the top, and the j, which is guilty of a similar irregularity at the bottom, have to be subjected to a different treatment, as the ordinary rubbing would remove a portion of the letter; they are therefore carefully rubbed at the edge of a specially-prepared file, or put into a small machine, which cuts out the "kern," as it is called, and leaves the types so that they will not "ride" or rest on each other, and so break off.

I may mention that in many modern newspaper founts the f and j are altered a little in shape, so as to bring the whole of the letter on the body of the type—a little “uneasiness” in the appearance of the letter being preferred to the annoyance of finding the dots of the letters broken off. After rubbing, the types are taken in hand, literally, by the “setters,” another small army of boys, who pick them up and place them side by side in long sticks, with their heads at the top and the nicks in the body of the type outwards. They are then ready for the dressers; these are men of experience and trustworthiness, upon whose care depends a great deal of the credit of the foundry. They first take the stick, nearly a yard long, filled with types, which they handle as if it were solid; they turn them face downward in blocks made for the purpose, and, after locking them up tightly, with a small plane cut a groove in the foot of the types, removing thus the small unevenness left by the removal of the break. A smooth file is then rubbed lightly along to polish the feet, and then they are taken out of the blocks, and the file run over the back and front. A few types are then taken out at each end and the middle of the stick, and these are carefully tested for body, by a dozen of them being placed together against a standard of steel; for height, by careful testing against another standard; for line, &c., by another kind of gauge, and then, if they succeed in passing muster, so far as their bodies are concerned, they are passed on to the picker, who, with a powerful glass in his eye, looks at the face of each letter separately, and throws out with his pick as he passes all which he finds in any way faulty. The types are then made into smaller lines, the lines into pages, and put into stock, and from these pages are made up the founts as required for printers.

So much for ordinary founts; for the large types suitable for posting-bills, a different mode of manufacture is re-

quisite. In consequence of the impossibility of striking a punch of the size required into a matrix, these types were at first cast in sand, but as the roughness of face which they exhibited was an almost fatal defect, William Caslon IV. invented a mode of making matrices, which he called, with justifiable pride, "Sanspareil," a name which still clings to the types cast from them, though I dare say few of the present generation of founders have any idea of the origin of the name. This method consisted in cutting out the shape of the letter desired in plates of brass, the back being cut a little larger than the front, the sloping edge thus formed making the shoulder of the future type; the cut brass is then firmly rivetted to a smooth surface of brass, which forms the face of the letter when cast; the matrix thus formed then undergoes the process of justification. The moulds for these larger sizes are, of course, much larger than the book letter moulds, and, in place of being held in the hand, they are fixed to the wall, and have long handles to manipulate them; they are also provided with cores, to enable the bodies to be cast hollow, in order to lighten the formes when they are set up.

The original matrices made in this way were transferred to the Sheffield foundry in 1819, when Messrs. Blake and Garnett purchased the foundry of William Caslon IV., and for many years the successors of these gentlemen retained a pre-eminence in the manufacture of letters of this size. Of late, however, letters cut in wood have, to a great extent, superseded metal letters, as the latter could never be cast of a size approaching that now common upon our walls. The largest cast types I have seen do not, I think, exceed about five inches deep.

Many efforts have been made to reduce the cost of production of types, by casting, for instance, several letters at once in the style of a comb, of which the types would form

the teeth, but the accuracy which is an absolute necessity in type-founding could not be attained, and the mode I have described is likely to be continued, with but slight improvements, for many years to come. In the model exhibited, for the loan of which I am indebted to Messrs. Caslon & Co., the machine is turned by hand, but throughout the trade now steam is adopted as the motive power, and one man is thus able to superintend two machines.

As an example of accurate justification, I have brought a specimen of French types, prepared for the Exhibition of 1851, and when I mention that of the music, each square inch is composed of about one hundred and fifty types, and that a joining is scarcely to be seen in it, you will agree with me that it is a marvellous piece of work. I also show specimens from the foundry of Messrs. Stephenson, Blake & Co., to whom I am indebted for all the tools, &c., other than the machine, and by permission of our president I am enabled to show a copy of a French founder's specimen-book, which forms one of the treasures of our Free Library. It is only fair to English founders to state that, not only can they compete in accuracy of justification with our French neighbours, but they can far surpass them in the quality of their cast type. One of our English foundries has a branch in Paris, and England is now the centre of the type-founding trade.



ON THE TRANSLATION OF Συνίημι AND ITS  
FORMS, AND OF ἵνα μὴ WITH A SUBJUNCTIVE  
MOOD, IN THE AUTHORISED VERSION OF  
THE NEW TESTAMENT.

By J. BIRKBECK NEVINS, M.D. LOND.

THE words to which I desire to ask your attention are of frequent occurrence in the New Testament, and are there used in a variety of senses, and it is necessary to take the context into consideration before being able to judge with what meaning they are employed in any particular instance. This is generally unaccompanied by difficulty, and in most instances the Authorised Version appears to give their full and true interpretation ; but there are a few cases in which it appears either to fall short of their real significance, or to convey a meaning different from that which I think the Greek text implies, and it is to these cases I invite your consideration.

In the Authorised Version of the New Testament, Συνίημι and its derivatives frequently occur, and they are generally, if not always, translated by some form of the verb, "to understand," which generally conveys their true meaning ; but I have to ask your consideration of a proposed change of translation from "understand" to "attend," in a few places, as bringing out the true sense of the word more correctly, and conveying more fully the lesson which it is intended to teach in these places.

This is especially the case in the familiar parable of the Sower, from which I shall quote merely the necessary passages.

In the 13th chapter of St. Matthew, verse 19, we read, “When any one heareth the word and understandeth—συνίετος—it not, then cometh the wicked one, and catcheth away that which was sown in his heart;” and in the 23rd verse, “But he that received seed into the good ground is he that heareth the word, and understandeth—συνίω—it; which also beareth fruit,” &c. The parable in St. Mark, ch. iv., v. 20, is related in different words, both in the Greek and English. The English version, speaking of the good ground, says, “such as hear the word, and receive it, and bring forth fruit;” but the Greek word translated “receive”—παραδέχονται—implies more than simply receiving, for the words given in the dictionary as its meanings are, in addition, to “receive,” “welcome,” “entertain,” “embrace,” “approve,” all implying something of willingness in addition to simple reception.

In St. Luke, ch. viii., v. 15, there is again a difference, the English words being, “that on the good ground are they which, in an honest and good heart, having heard the word, keep it, and bring forth fruit with patience;” but the Greek word κατέχουσι, translated “keep,” means something more than simple keeping, and “keep fast,” or “hold fast,” would more truly convey its force. The Greek word ὑπομονή also loses its real value in this parable when translated “patience,” which, in modern English, conveys the idea of more or less suffering or trial; and it would be equally correct, and more in accordance with the evident meaning of the parable, if it were translated “perseverance,” or “constancy.”

In St. Luke, therefore, as well as in St. Mark, we have the element of will introduced in the parable; but this element appears to be wanting in the parable as narrated by St. Matthew, if the Authorised Version is the correct one, for it appears as if the abundance of the fruit depended upon the “understanding” of the hearer, rather than upon his

will; upon his intellectual powers, rather than his moral character; and it is to this question that we will now turn.

The Greek word translated "understand,"—Συνίημι—is a compound, consisting of the preposition Συν, "together," and Ιημι, "I send," and the meanings are—

- To send or put together;
- Combine or join;
- Engage;
- Understand;
- Attend;
- Become skilful, act wisely.

The primary meaning of the word is simply sending or putting together, which may be without any definite plan; but the idea of order in a putting together is so natural, that the further meanings, "combine, join," are almost self-evident.

The requisite for making a "combination," as distinguished from a mere "putting together," is *attention* to the matters to be combined, and *understanding* so as to accomplish the junction; and it will probably appear to most minds that the attention is an indispensable requisite before the understanding can be attained; and as the result of combined attention and understanding, we "become skilful," and "act wisely."

Now the bearing of this analysis of the meanings of Συνίημι is as follows. If it is translated "attend," then the parable will run—"When any one heareth the word and attendeth not, then cometh the wicked one and catcheth away that which was sown in his heart," which is a natural and deserved result of his want of attention. "But he that receiveth seed into the good ground is he that heareth the word and attendeth to it, which also beareth fruit," &c., a favourable result of his attention, which is as natural as the unfavourable result from the inattention of the other.

This interpretation of St. Matthew's words harmonises with what seems the natural interpretation of the totally different words used by the other Evangelists, and it represents the result, whether good or bad, as following the moral attitude of the hearer, instead of attributing the barrenness of the one hearer to a want of intellectual acumen, and the fruitfulness of the other to his greater intellectual powers.

The word occurs again in the 15th verse of the 18th chapter of St. Matthew, as a quotation from the Old Testament: "For this people's heart is waxed gross, and their ears are dull of hearing, . . . . lest at any time they should hear with their ears, and *understand* with their heart, and should be converted." The word "understand" is again the translation of the Greek word συνιᾶσθαι, but the passage only professes to be a quotation in Greek from a message that was originally given in Hebrew; and as I have unhappily no acquaintance with that language, I hope that we shall have the advantage of hearing from our friend and member, Professor Prag, what is the real force of the word in the original Hebrew. It will be in your recollection that this denunciation was made to the Jews because of their disregard of the law and the commandments given to them by their prophets and teachers; and the meaning of the message which Isaiah was desired to give seems to be, that he was to threaten them with what is sometimes called judicial blindness or deafness, because they would not attend to the light or the instructions given them. On turning to the Septuagint, to see whether it throws any light upon the subject, we find that that book employs merely another form of the same word which is quoted by St. Matthew, namely, συνῆτε, "hearing, hear, and do not *understand*," so that we do not derive any help from that; but the Vulgate translation of this passage in the Septuagint is remarkable, and seems to point in the direction indicated in this Paper, for it

reads thus:—Isaiah, ch. vi., v. 9. “Et dixit, vade et dices populo huic audite auditores, et *nolite* intelligere;” hearing, hear, and be *unwilling* to understand. The element of will, or of moral attitude, is brought out prominently in this passage in the Vulgate, whilst it is left undetermined by the Greek, and is entirely omitted in the Authorised English Version of this word, Συνίημι.

A totally different quotation, containing, however, the same word, is met with in the 3rd chapter of the Epistle to the Romans, at the 10th and 11th verses:—“Καθὼς γέγραπται ὅτι οὐκ ἔστι δίκαιος ὁνδε ἵς: οὐκ ἔστιν δὲ συνιῶν, οὐκ ἔστιν δὲ ἐκζητῶν τον θεον;” which is translated in the Authorised Version: “There is none that doeth good,” here is the moral element; “there is none that *understandeth*,” which describes merely intellectual deficiency; “there is none that *seeketh after God*,” where, again, we have the will and the moral element introduced. So that, as the passage stands in the Authorised Version, there is, first and last a denunciation of moral guilt or moral negligence, and between these two charges blame appears to be imputed for intellectual deficiency. But if *συνιῶν* is translated “*attendeth*,” then the passage will run—“there is none that *doeth* good, there is none that *attendeth* (to the words of instruction), there is none that *seeketh after God*.” In each case it is the moral attitude that is the subject of blame; and the proposed change of translation appears to render the quotation harmonious throughout, and consistent with what might be expected from the Searcher of Hearts, while, as it stands at present, there is an inconsistency between its various portions, and blame appears to be imputed for what can scarcely be regarded as a fault, viz., intellectual incapacity.

In the discussion, Rabbi Prag, Professor of Hebrew in

Queen's College, Liverpool, and Rabbi of the Synagogue in Prince's Road, Liverpool, said—

"The Hebrew equivalents for the word 'understand,' which occurs in the 9th and 10th verses of the 6th chapter of Isaiah, and which in the Septuagint is rendered συνίητε, are יְמִינָה and יְמִינָה. The former is in the third person plural of the future tense, 'They shall understand,' and the latter in the third person singular, 'He shall understand.' The radix of this verb is יְמִן or יְמִין, denoting 'to attend perseveringly, to distinguish, to understand,' and is apparently connected with the root יְמִין, 'to build, to form,' both verbs being defective and of similar consonants, viz., יְמִין. From this it may be inferred that the original meaning of יְמִין, 'to understand,' is *to construct, to form thoughts and ideas systematically, so as to gain a clear comprehension of the subject required.* בְּנִים, sons, from בָּנָה, 'to build,' denotes, in Jeremiah xlix. 7, 'the wise.'

"The passage in question, as rendered in the Authorised Version of the Bible, seems utterly incomprehensible.

"'Make the heart of this people,' &c. Is it likely that the Divine Creator will have commanded his prophet to close the heart and the eyes of any of his human creatures against the beauties and propriety of his instructions, and to prevent them from becoming repentant and being healed?

"The correct translation of the two verses is the following:—

"v. 9. And He said, Go, and tell this people, they hear incessantly, but do not [care to] understand; they see continually, but do not [care to] perceive.

"v. 10. [This] will render the heart of this people fat, make their ears heavy and their eyes blind, that they shall not\* be able to see with their

\* Authorised Version: *lest*, the Hebrew term is יְמִינָה, and denotes, wherever it occurs in the Bible, "that not."

eyes, to hear with their ears, and understand with their hearts, and repent and be healed."

The Rev. George Butler, Principal of the Liverpool College, writes:—

"(1) *συνίημι* (I send along with) is never used in the New Testament in its original meaning.

"(2) In the sense of 'animadverto'—'I give my attention'—it is frequently used. But it means something more than this. It commonly means at least as much as our own word 'understand,' *Lat.* 'intelligere': sometimes it may be rendered, 'lay to heart,' *Lat.* 'in animo recondere.' However, all these may be classed under one head.

"(3) In one passage, Rom. iii. 11, it seems to mean, 'Deum colere,' worship God.

"All the passages that I know of referable to the second head are—

Matt. xiii. 18, 14, 15, 19, 51; xv. 10; xvi. 12; xvii. 18.

Mark vii. 14; viii. 17.

Luke ii. 50; viii. 10; xviii. 84; xxiv. 45.

Acts vii. 25; xxviii. 26, 27.

Rom. xv. 21.

2 Cor. x. 12.

Eph. v. 17."

From the discussion, therefore, it would appear that the primary meaning of the Hebrew is "to attend perseveringly," which contains the element of will; and understanding is the result; and that the root "to build, to construct," also conveys the idea of attention, before the result is attained of "gaining a clear comprehension of the subject," in other words, "understanding :" and the Hebrew also bears out the suggestion now put forward, that "attend" should be substituted for "understand," in the passages under consideration in the Authorised Version of the Bible.

*"Ινα μὴ, with a Subjunctive Mood.*

This form of expression occurs in an important passage in the Epistle to the Galatians, ch. v., v. 17, of which I now ask your consideration, as the manner in which it is translated in the Authorised Version appears to me to be, not simply defective, by failing to give it full force, but incorrect, by conveying a meaning almost the opposite of what St. Paul really intends to express. In any inquiry, however, into the meaning of a Greek expression in the New Testament, the first requisite is to examine the way in which it is used by the New Testament writers themselves, as Hellenistic Greek by no means corresponds in meaning at all times with Classical Greek; and I therefore commenced the investigation into its meaning in the present case by examining every instance in which Ινα with a subjunctive, and either with or without the negative μὴ, occurs in the New Testament. The instances amount to hundreds, and the value of the expression is exceedingly different in different places, so that each case has to be considered upon its own merits, and to be decided chiefly, if not entirely, by the context.

The phrase under consideration occurs in the 17th verse of the 5th chapter of the Epistle to the Galatians, as follows: “For the flesh lusteth (longs for, or wishes for) against the Spirit, and the Spirit against the flesh; and these are contrary the one to the other: Ινα μὴ, δὲ ἡλητε, τὰυτα ποιῆτε,” which is translated in the Authorised Version, “so that ye cannot do the things that ye would.”

Now, the first point to be noticed, in examining this passage, is, that the word “can,” “cannot,” in the English, is an auxiliary which has no place in the Greek, in which we have merely the subjunctive mood, commonly said in our grammars to mean “may,” or “can.” In this instance the auxiliary “can” was adopted by the translators of the Autho-

rised Version, and the object in view in this Paper is to show that "may" would more truly represent the meaning of the passage, and that, when thus translated, the interpretation will correspond more nearly than at present with the facts of our nature, as compounded of flesh and spirit. After having pursued the investigation for some time, I gave it up, from finding that in Dean Alford's version of the New Testament the verse was given, "so that ye may not do the things that ye would," instead of "so that ye cannot." No explanation is given of the reason for the change, nor any allusion to the important difference of meaning implied in the different rendering; but as the change had been made, I thought it had become a settled matter that "may" was right, and "can" was a mistake, until I observed, a few weeks since, in a version of the New Testament recently published, and professing to exhibit the most recent knowledge of the text, &c., that the Authorised Version was still followed in this case. I therefore hope for your indulgence in having brought the subject forward, if the question should, after all, be shown in the discussion to be a settled one among biblical linguists.

The word *Iνα* is translated in the dictionary "that," "so that," "to the end that," "if," "if so;"

"*Iνα μη*," "that not," "lest," "lest that;"

"*Iνα τι*," "to what end or purpose," "wherefore," "why." In every case, whether alone or in combination, *purpose* is implied by the word; and if we substitute "in order that," or "to the end that," for "so that," in translating the verse under consideration, we shall see at once that "in order that ye cannot do the things that ye would," is an unmeaning expression; while "in order that ye *may* not do the things" is a perfectly intelligible and rational sentence.

It is to be noticed, also, that when St. Paul wishes to express "cannot" without any uncertainty as to his meaning, he does not employ the subjunctive mood, but says

plainly, "are not able." In the 10th chapter of the First Epistle to the Corinthians, v. 21, he says, "Οὐ δύνασθε ποτήριον πίνειν, διὸ δύνασθε τραπέζης μετέχειν," "Ye are not able to drink the cup; ye are not able to partake of the table;" which is translated in the Authorised Version simply as "ye cannot."

Two questions, therefore, arise. First, Does "Ινα always imply purpose when used by the New Testament writers? and, Second, Can any rational and intelligible explanation be given of St. Paul's object in telling the Galatians that the Spirit and the flesh were opposed to and strove with each other, for the express purpose of preventing us from doing what we would?

Now, the answer to the first question is, that "Ινα is used repeatedly in the New Testament without implying any purpose. It is employed as a substitute for ὡστε, or ὅτι, and in other ways that have no reference to purpose or intention. A few examples of this may suffice.

Matt. vii. 12. "All things therefore that ye would that men should do to you."

„ viii. 8. "I am not worthy that thou shouldest enter under my roof."

„ x. 25. "It is enough for the disciple that he be as his master."

„ xii. 16. "And he charged them strictly that they should not make him known."

„ xiv. 36. "And besought him that they might but touch the hem of his garment."

Mark iii. 9. "And he spake to his disciples, that a small ship should wait on him." In this instance, "in order that" would be clearly a mistranslation; but in the very same verse, ινα is

used, implying purpose, "in order that the crowd might not press him."

Mark „ 12. "And he straitly charged them that they should not make him known."

„ v. 10. "And he besought him much that he would not send them out of the country."

„ vi. 8. "And he commanded them that they should take nothing for their journey."

Luke iv. 3. "Command this stone that it be made bread."

„ viii. 32. "And they besought him that he would suffer them to enter into them."

„ ix. 40. "And I besought thy disciples to cast him out."

„ ix. 49. "But they understood not this saying, and it was hid from them, that they perceived it not; and they feared to ask him."

„ xvii. 2. "Better for him. . . than that he should offend one of these little ones."

John iv. 34. "My meat is to do the will of him that sent me."

„ vi. 29. "This is the work of God, that ye believe on him whom he hath sent."

„ vi. 89. "This is the will of the Father that sent me, that of all which he hath given me I should lose nothing."

These may suffice for illustrations from other writers, and

if we examine the mode in which St. Paul himself uses the words we are considering, we find that he also employs them sometimes, but not frequently, without implying "purpose," *e.g.* :—

- 1st Ep. Cor. i. 10. "Now I beseech you, brethren, that ye all speak the same thing."
- ,, i. 17. "Not with wisdom of words, lest the cross of Christ should be made of none effect."
- ,, iv. 2. "Moreover it is required in stewards, that a man be found faithful."
- ,, vii. 29. "It remaineth, that both they that have wives be as though they had none."
- ,, ix. 15. "It were better for me to die, than that any one should make my glorying void."

He uses it in the Epistle to the Ephesians, both as implying purpose and without any reference to purpose, in the same chapter—the 5th—when describing the duties of married life :—

- Ep. to the Eph. v. 25. "As Christ also loved the church, and gave himself for it; that he might" (implying purpose).
- ,, v. 33. "Let the wife see that she reverence her husband" (not implying purpose).

It is, however, I think, beyond doubt that the expression under consideration is generally used to imply purpose by the New Testament writers, whether it is employed alone or in combination with the negative μή. "Ινα πληράθη"—"that it might be fulfilled"—is an expression of such constant occurrence, that it only requires to be alluded to to be recognised. And when every instance is examined in which the combination

of "Ινα with a subjunctive occurs in the New Testament—and they are very numerous—it appears to me impossible to doubt that purpose is implied in the verse under consideration, and that "in order that ye *may* not do the things that ye would" is the only rendering that is capable of conveying its meaning. We come, therefore, to the consideration of—Why should the flesh and the spirit strive against one another, in order to prevent us doing what we would? And I think that we meet with the answer in one of those paradoxical sayings of Solomon, which sometimes puzzle and at others delight us. In the 7th chapter of Ecclesiastes, at the 16th verse, he says, "Be not righteous over much, neither make thyself over wise: why shouldest thou destroy thyself. Be not over much wicked: why shouldest thou die before thy time." Solomon here appears to indicate two opposite lines of thought and conduct, which met in their greatest contrast in the school of the Hermits as represented by S. Simon Stylites on the one hand, and in the utterly debased condition of society on the other, previous to the destruction of the Roman Empire. These two schools have probably always existed in varying degrees; and, in a modified form, they may be described as the ascetic on the one side, and the Epicurean or sensual on the other. Now, whoever would influence mankind at large, must bear in mind the two-fold nature of which it consists; and Solomon's caution, "Be not righteous over much; why shouldest thou destroy thyself," is but another mode of saying, Do not forget that the body has its requirements as well as the spirit, and if this is overlooked, you will destroy yourself when trying to be wise above measure. And, on the other hand, do not give the reins to your mere bodily appetites, for that will but cause you to "die before your time." The same teaching precisely is contained in St. Paul's remarks, that the spirit strives against the flesh, *in order that* man may not be sunk in

sensuality and become a mere beast, while the flesh also strives against the spirit, *in order that* we may not be misled into thinking that we are angels before our time and despise our bodies, but that we may, by proper care of them, be enabled to fulfil our several duties in life, of which one of the first, and not the least attended with accompanying blessings, is, that men must work. But if work is a primary object of man's existence, it is of the last importance, looking at human nature as it is, that his work should be done with a good courage and with all his heart; and if we are prepared to admit that it is a sound philosophy which recognises the benefit of the contest carried on between our two natures, I think we shall be ready also to admit that the teaching which boldly puts this forward and shows its beneficial character is better calculated to give a good courage and to help the man forward in his daily work, than a teaching which should represent to him that he is powerless to resist evil, and cannot do the good things that he would.

Now, we know that schools of thought have existed, as a matter of fact, which have been based upon the belief that the flesh is so triumphant in this contest that it is impossible to do good; and if we feel that success is impossible, the result soon occurs that effort slackens, even if it does not entirely cease. But if there is good reason for believing that the contest is on purpose that we may not do the *evil* that we would, it is then waged with a braver spirit and a brighter hope, and not only is *Excelsior* carried on our banner, but we may fairly trust that *Excelsissimum* will be our home.

On these grounds, then, I submit the altered translation to your criticism.

- 1st. That it is the correct one.
- 2nd. That it is in perfect accordance with the facts of our nature, and
- 3rd. That it contains a much more ennobling and

elevating teaching, and is better calculated to make man a victor, than that which represents him as vanquished from the very commencement of the strife in which he is engaged through life.

The Rev. G. Butler said, in a written communication, "The true sense of *Iνα μὴ* is 'telic,' i.e., signifying purpose, 'that, not,' e.g., 1 Cor. iv. 6, *Iνα μὴ φυσιῶσθε*, 'that ye be not puffed up.' Some think this is the present indicative; I regard it as an Alexandrine form of the subjunctive. In Homer *Iνα* is also used with an apparent indicative, *Iν ἔδομεν ἀμφω*, which really is, *ἔδωμεν*, shortened. Alford insists that this is the only meaning the particles can have. I do not agree with him, e.g. John xix. 81, *Iνα μη μείνῃ*, 'ne manerent,' lest they should remain. They seem to me occasionally to mark a result, as *ἄστε* is used; Luke ix. 45, *Iνα μὴ ἀισθάνται*, 'ita ut non intelligerent,' so that they did not understand, when *ἄστε μὴ ἀισθασθαι ἀντοῦ* would be the more usual Greek.

"Luke viii. 10, *Iνα βλέποντες μὴ βλέπωσι καὶ ἀκόνοντες μὴ συνιῶσιν*, so that although seeing (outwardly) they do not see (inwardly), and although hearing they do not lay to heart (or understand).

"The interpretation of this passage is of great importance, for the question of human responsibility depends upon it.

"I refuse to accept an interpretation which would make an Omnipotent Being *first* the author of His creatures' ignorance, and *then* their punisher on account of that ignorance.

"I also refuse to interpret John xix. 36, *Iνα οὐ γραφή πληρώθῃ*, 'in order that the Scripture might be fulfilled.' I think it is equivalent to *ἄστε πληρωθῆναι τὴν γραφήν*. 'So that the Scripture was, *ipso facto*, fulfilled.' Although Alford and others have some reason on their side when they say, The 'Author of Revelation and inspirer of ancient prophecy in the Old Testament, is the same as the Author of

man's Redemption in the New Testament, and He may as well control human actions to justify His word, as utter beforehand words which hereafter will be exemplified in action.'

"There are other passages where Ινα μή is used in the 'telic,' i.e., the proper sense, viz., in 2 Cor. ii. it occurs three times. Cor. vi. 8; and it may be used very many times.

"We must remember that the word Ινα does not always mean 'that.' It is sometimes an adverb, and means 'where,' as in Sophocles—δυχ ὁρᾶς; ινε 'ει κακοῦ, 'See you not in what misfortune you are (lit. where, in regard of).' As, therefore, the particle Ινα has no 'telic' force in certain expressions, there is no reason why, in combination with μή, it should have it invariably.

"Again, Alexandrine Greek (commonly called Hellenistic) is by no means so accurate as Attic Greek. And I should not scruple to reject an interpretation, even if the ordinary usages of the Greek language were in favour of it, if it appeared to me derogatory to our conceptions of God's justice and man's free will.

"I believe that Jesus Christ offered salvation to all. I do not believe that he used dark riddles to blind men's eyes. He did not teach in parables till the Jewish authorities had ascribed His miracles to Beelzebub; and He had an object in avoiding collision with the Jewish authorities—namely, that He had a spiritual kingdom to found, ministers to train, doctrines to disseminate, and the example of a blameless life to set, before He resigned himself to the Jews, who sought to kill Him.

"Till that time His invitation was, 'He that hath ears to hear let him hear.'

"No amount of argument, based on Greek particles, will convince me that He purposely blinded men's eyes, and closed their ears, to the truth."

In reference to the question as to whether ἵνα η γραφη πληρωθή should be interpreted "in order that the Scripture might be fulfilled," or "so that the Scripture was (*ipso facto*) fulfilled," as proposed by Mr. Butler, the expression in St. John xix. 28 appears deserving of notice, as illustrating the sense in which it was meant by that Evangelist; for he writes about an unfulfilled Scripture, and says, "in order that it might be fulfilled" or "completed" Jesus said, "I thirst." ἵνα τελειωθῇ η γραφὴ, λέγει Διψῶ—and as a result some one ran with a sponge and vinegar, and Jesus tasted it, and then said, "It is completed," τετέλεσται, which would appear to indicate that the expression ἵνα πληρωθῇ refers to a purpose to be completed, rather than to a fact which has been accomplished.

St. Matthew, also, who uses the expression more frequently than any other Evangelist, appears to shew that he does not use it in the past tense, for he does not employ it at all in one important passage, where he is speaking without any doubt about an accomplished prophecy, viz., the slaughter of the children in Bethlehem. He there says, Matt. ii. 17, τότε ἐπληρώθη το ρῆθεν then *was* fulfilled, although, in the same chapter, at the 15th verse, he has employed his familiar expression about the prophetic reason for the flight into Egypt, ἵνα πληρωθῇ, that it might be fulfilled, "out of Egypt have I called my Son."

But at the time referred to Jesus had not returned out of Egypt, and therefore he was not yet called out of Egypt, and the prophecy was not in fact accomplished at the date of which he is speaking.



THE AUTOBIOGRAPHY AND MEMORIALS OF  
MISS HARRIET MARTINEAU.  
By EDWARD R. RUSSELL.

The book of 1877 has the following title:—“*Harriet Martineau's Autobiography, with Memorials by Maria Weston Chapman.*” The title-page bears two mottoes:—“Etiam capillus unus habet umbram suam,” a proverb, and these words from Lord Bacon:—“And this dear freedom hath begotten me this peace, that I mourn not that end which must be, nor spend one wish to have one minute added to the uncertain date of my years.” Owing to the peculiar manner in which the book has been produced, it is not apparent whether these mottoes were chosen by the writer of the Autobiography or the compiler of the Memorials—a point which, in her zeal and devotion, Mrs. Chapman may not have thought of much importance, but the doubtfulness of which is fretting in its effect upon those who at a greater distance have honoured Miss Martineau as profoundly as the Editor herself. This is not the only instance in which the book tempts one to wish Miss Martineau's friends a little farther from her side.

It is in three volumes, and has two imprints. One, attached to the first volume and the second, preserves the memory of one of Miss Martineau's characteristic, if not eccentric, fancies. She completed the Autobiography in 1855, when she was fifty-three years old, and stricken with a disease which she expected to bring her life to a speedy end. Veteran author as she was, and in daily communication with London, she preferred to have her life printed, with due precautions for secrecy, at Ambleside, and there the sheets

have lain for twenty-two years, until brought out and bound up in two out of the three volumes of this work, which will reveal the personality of Harriet Martineau in sharp, if not bold, relief to future generations.

For the third volume, the Editor, Mrs. Chapman, is solely responsible, and if she possesses any of her beloved friend's sensitiveness, she must by this time have fully felt her responsibility. She has been laughed at for her heroics—her “north wind,” and her “rose leaves,” and her grand concluding extract about those from whom Persephone accepteth atonement for an ancient woe. She has been quizzed for her English—strange to say, a weak point in more than one of Harriet Martineau's idols. She has been blamed for publishing letters which Miss Martineau would have suppressed, and for aggravating a flavour of family bitterness, which in the Autobiography is comparatively faint. I shall not echo or support these censures. As to the lady's English and her raptures, it is enough to say she is an American philanthropist. On the more serious questions we must remember that no precise rules of taste or propriety, or even utility, can be laid down on the subject of biography. How much or how little should be told, and why, or why not, are points on which there are as many opinions as readers. Each notable book of this kind must stand or fall by its fortunes, rather than by its merits, according to any invariable standard of criticism. Mrs. Chapman appears to have received from Miss Martineau ample powers, and everything in the book suggests that her friend would have seen no fault in anything she did.

They first met in America, in 1834, when Miss Martineau bravely travelled through the excited States with Abolitionist colours flying. Mrs. Chapman was one of the little band of like-minded Americans who were pioneering for the emancipation, which, like many other good things, was to be

brought about eventually only by war. One day she came and told Miss Martineau they were threatened by a mob. "I hear now," says Miss Martineau, writing twenty years after, "the dear silvery tones of her who was to be the friend of the rest of my life. I still see the exquisite beauty which took me by surprise that day; the slender graceful form—the golden hair which might have covered her to her feet—the brilliant complexion, noble profile, and light blue eyes—the aspect, meant by nature to be soft and winning only, but that day (as ever since) so vivified by courage, and so strengthened by upright conviction, as to appear the very embodiment of heroism." When this warm worshipper, whom the English world little suspected of such a fund of idolatry—Mr. Atkinson not having then risen above the horizon—returned to her home and avocations, she found that "her relation to Mrs. Chapman required her greatest moral care." "The discovery of her moral power and insight," says Miss Martineau, at the date of the *Autobiography*, "was to me so extraordinary, that, while I longed to work with and under her, I felt it must be morally perilous to lean on any one mind as I could not but lean on hers. Thus far, whenever we had differed (and that had not seldom happened) I had found her right; and so deeply and broadly right as to make me long to commit myself to her guidance." Hence the celebrated Harriet Martineau found it necessary to avoid being constantly with the unknown Maria Chapman, because "such a committal" of oneself to another "can never be otherwise than wrong." To some, such self-abnegation in a woman of such intellectual strength may seem unnatural. I shall presently say why I think it entirely consisted with the type of Miss Martineau's power. At all events, it and the whole subsequent course of her judgment of Mrs. Chapman warrants us in supposing that she would not have vetoed anything Mrs. Chapman chose to publish about her. So

long as readers can distinguish what Miss Martineau herself left for publicity, no harm is done, although some of the things published may be painful to her connections. A family which produces one of the greatest men and one of the greatest women of a century must submit to the penalties of a grandeur brighter even than that which illuminates the least and obscurest incidents of palaces. Privacy it must virtually forfeit. Nor need the world go mourning over the feelings of a sister who could express in print her disappointment, forsooth, with such a brother as James Martineau, or of a brother who could scathe such a sister as Harriet Martineau in the pages of a review. If there are grounds of serious complaint, it is not on behalf of the family, who must take their chance, nor on behalf of public men, whose distinction makes them virtually the property of the world, but on behalf of several persons of private station, whose accidental associations with Harriet Martineau have led to their being mentioned here a great deal more freely than to quiet, retiring people is agreeable.

The three volumes, as they stand, are a very complete exhibition of Miss Martineau's character, and so far as she prepared the book it is a tribute to the value of Autobiography. When she had once begun her narrative, the completion of it became a necessity, not for the mere pleasure, nor because she had in any considerable degree to justify herself, but because, as she wrote, the convictions deepened which she expressed in the beginning, that from the most meagre to the fullest all autobiographies were of great profit, and that she, from the strength of her memory, was especially fitted to write a useful one. Yet it may be doubted whether utility is the strong point of her reminiscences, and we may with confidence deny that such utility as it has lies in the elements of her recital to which the biographer attached most importance.

Persons deeply interested in literature are often tempted to doubt the value and propriety of lives and memories, which, in revealing the characters of authors, do not sustain those conceptions of their personality which have been formed from their works. Such is the case of Heine, for instance, and perhaps of Dickens. It would be a bold innovation, however, to discourage the exhibition of what at the very least must be curious and instructive mental and moral studies; and the thing to be insisted on is not that great writers should be kept artificially on the level of their books, but that we should judge their writings and themselves justly apart, except so far as it may be useful to fix the mind occasionally on the fact that men and women capable of such and such weaknesses have produced such and such great works. The mind, even of an average reader, may be easily drilled into appreciating a great work in spite of its author's littlenesses.

The literary character has many defects, some seated in its essential temperament and constitution, some the accretions of usage, nearly all susceptible of correction; and to their correction the publishing of literary lives must surely tend. Miss Martineau had only one of the acknowledged foibles of literary persons—a certain fretful irritability, lying in wait not only for criticism, but for all sorts of small maltreatment by Society. In her, however, this was corrected by a good opinion of herself, too well-founded and too far removed from vanity to permit of her becoming ridiculous. As a writer, therefore, she will not suffer in estimation from the publication of this *Autobiography*, as authors often do from revelations, however prudent, of their actual daily lives. All is not said yet, however, on this question of the utility of her memoirs.

Whatever may have been the case with the other Martineaus, Harriet and her brother James were by congenital temperament Methodists—or, in deference to their

ancestry, shall I say Huguenots? remembering that a great French critic has said that Geneva has always been a vestibule of Proselytism for that Christian awakening for which Methodism is another name. *He* was a Pietist who found peace in the soothing beliefs and devout practice of Unitarianism. *She* was a Pietist who could not find peace until she altogether gave up seeking it in theology. The usefulness of the story of her life, as she saw it, lay in telling first of the early home treatment out of which she supposed the habit of mind which I call Methodism grew; secondly, of her partial manumission by the adoption of the doctrine of necessity; and thirdly, of her total emancipation by the adoption of Atheistic Materialism. Here she was mistaken. The book has no utility, no philosophical merit or importance, in this aspect, except as a morbid study, whose only interest lies in the fact of so clear and fine a mind having become the prey of empty sophisms and an emptier sophist.

Harriet Martineau was a fretful, irritable, haunted, "injured" child, as many a one has been in whom the literary faculty was really the absorbing substance of being and character. Such children are seldom understood. Anyone who, having been such a child, has had parents who did not rudely crush or abrade his or her nature day by day with rude though unconscious cruelty, has a great boon to be thankful for; and what is bad always was certain to be very bad in a prim Unitarian household in a provincial city at the most rigid period of English family manners. The morbid young girl sought relief in intense religiousness, and found some in the happy accident of receiving from an excellent master a masculine education. Deafness came, and brought upon her new unkindness, or what she looked upon as such, from her family. Her life thenceforward, till her father's commercial anxieties and death broke up the home, appears to have been a curious mixture of wounded susceptibilities,

fairly encouraged intellectual activity, peculiar whims of shyness and mystery, substantial domestic happiness, and incessant but perpetually baulked yearnings for effusive filial relations. In all this, in after years, Miss Martineau and Mrs. Chapman appear to have read a history of coarse and blind ill-treatment, whereas it was only the natural routine of a placid but solid and self-respecting English middle-class family, disturbed and fretted by the peculiarities and dogmatisms of a clever, singular, and not too agreeable daughter. The whole course of average domesticity and education is not to be assigned as criminal, because, under such circumstances, such a daughter does not carry into her future life very agreeable recollections of her youth.

When Miss Martineau had made her mark, and become a great personage, when she found herself within a few months of her first signed publication a lion of London—and when lords and *litterateurs*, Cabinet Ministers and quarterly reviewers came crowding around the "little deaf woman from Norwich," who, Lord Brougham said, had beaten them all—she should have forgotten all about her Norwich vexations, her fancies, and her fumings, her early abandonment to solitary woe, and the rarely yielding coldness of a mother against whom, after all, she could bring no tangible accusation; and she should never have recurred to these things. It would save a great deal of trouble, indeed, if all persons who have public positions and public successes were philosophically to dismiss from their minds all thoughts of getting, or of ever having got, any comfort out of their relations. If they did so, whenever any such family comfort or appreciation came, it would be so much to the good, and their enjoyment would be in inverse ratio to the smallness of their expectations. I say this even on the supposition that Miss Martineau's and Mrs. Chapman's depreciatory insinuations as to Mrs. Martineau were in some degree just. If, as one hears it

whispered, these innuendoes of unmotherly conduct are groundless, it is so much the more to be regretted that the great authoress was not silent on and superior to all family grievances.

Miss Martineau had not this wisdom. Even in so small a matter as going to Westminster Abbey to see the Coronation, she cannot help laying it upon a brother, nearly twenty years after, that she was late, and got a bad place, and was very poorly after the ceremony. If, by way of contrast, we glance at so serious a question as love and marriage, we find indeed that here her experience was really tragical, for her quiet, uncomplaining lover suffered himself to be estranged from her, became insane, and died; but one does not like to read that it was all because "his family had been given to understand by cautious insinuations that she was engaged to another." Nothing could be in better taste or feeling than Miss Martineau's references to this unfortunate gentleman; but the cause of their severance might surely have been removed by a little frankness, and at any rate her way of regarding the affair in after years was extremely morbid.

The young man had absented himself when he thought she was rich. Like a gentleman, he reappeared when he knew she was poor. She "was at first very anxious and unhappy." Her "veneration for his *morale* was such that she felt she dared not undertake the charge of his happiness; and yet she dared not refuse, because she saw it would be his death-blow." How loftily she would have censured such a frame of mind in another! "Many a time did I wish," says she, "that I had never seen him. I am far from wishing that now—now that the beauty of his goodness remains to me, clear of all painful regrets. But there was a fearful period to pass through." What one regrets is that Miss Martineau did not really get through it. True to the characteristics of her temperament, she suffered this incident

to colour her views of marriage. Such natures dwell on every incident of their own lives as if the whole universe were occupied with them, and as if at every turn of their fortunes Providence were demonstrating for the eternal instruction of mankind some new and perplexing moral therefrom, whereas, in fact, there is an average of these things—an average of disappointed lovers, of libelled lady-loves, of spoiled marriages—an average even of Harriet Martineaus in their private and inferior aspects, though there is by no means an average of Harriet Martineaus in their public work, the number of them being too few and their distinction too grand and individual.

All through this book one is haunted by a conspicuous disparity between the greatness and excellence of a noble woman's work and the fretful fussiness of a weak woman's fancies. Those who regard the failings of each sex as ineradicable will see nothing in this to evoke lamentation. They will say "She was a woman : what else than such fancies do you expect ?" My reply would be, Did you expect of a woman the History of the Peace, or the Biographical Sketches, or the six splendid leading articles a week which for many years Miss Martineau wrote for the *Daily News* in its great days, or even the stories of political economy which she produced at thirty, getting her facts and principles from hand to mouth with the tact of a true publicist, but also with the true judgment of a publicist, always avoiding mistakes, and compelling the respect and admiration of the foremost statesmen of her stirring time ? If you had all these fine and masculine achievements from a woman, and from a woman who had had no advantages except those of nature's gift, and the happy accident of having pursued boys' studies under the instruction of a man, was it too much to expect in addition a manly reticence and private philosophy in proportion to the strength positively without feebleness, and the judgment

practically without flaws, which distinguished her professional and public character? That it *was* too much is evident from the fact that to pass from Miss Martineau's works to Miss Martineau's Autobiography is like quitting a conversation with Socrates to go and take afternoon tea with Xanthippe. But that it *ought not* to have been too much will be a cherished opinion of all who hold, as I do, that intellectual foibles are amenable to intellectual discipline—that moral deficiencies of sex, like moral deficiencies of constitution or race, are only demands for the exercise of self-control and self-modification—and that a woman who has got rid of the customary mental sterility of her sex ought to make short work of its frailties of mood and temper.

For my own part, I cannot help feeling that this Autobiography would have been very different in its treatment of the facts of her early life, if, instead of making the acquaintance of Mr. Atkinson, the mesmerist and prophet, she had come under the influence of a true philosopher, or even of a sensible man. It may be very fine to send people to sleep by passes and to lull their pain by your "dynamic glance," to get rid of the mystery and difficulty of free-will by pretending to fancy humanity an automaton, and to persuade your friends that though the Christian miracles are unbelievable your *clairvoyantes* can see what is going on a thousand miles off, and you yourself can foretell the future. A few words of healthy admonition to a woman such as Harriet Martineau, telling her to be as manly in herself as she was in her books, would have been better worth uttering than all the counterfeit science of Mr. Atkinson by which she was so unworthily enthralled.

I have spoken of the unfortunate tone of Miss Martineau's comments on her frustrated marriage, and, unless you think the subject too sentimental, I will be more particular on this head, because it happens that no more striking instance can

be afforded of the contrast between her writing about herself and what she wrote as an author. In her Autobiography she neither treats the subject like a philosopher nor lets it alone like a philosopher. First, she is careful to tell the world, as all mature spinsters tell their friends, that if she never had anything to do with love and marriage, it was not for want of opportunity, of which, she says, every literary woman has plenty, "but freedom of mind and coolness of manner dispose of it very easily." She "can easily conceive," indeed, "how some deep springs of her nature might have been touched then as earlier," but she "considers the immunity a great blessing under the liabilities of such a moral condition as hers was in the olden time." "If she had had a husband dependent on her for his happiness, the responsibility would have made her wretched. She had not faith in herself"—so she thinks, this vigorous, firm lady who battled with all the world in London, and held her own against publishers and politicians, flatterers and calumniators—"to endure avoidable responsibility. If her husband had not depended on her for his happiness, she would have been jealous. So also with children." The care would have overpowered the joy; the love would have been out of proportion to the chances of life; her fears would have impaired their freedom. Domestic life "is not for those whose self-respect has been early broken down, or has never grown." When she sees perfect conjugal love she shudders at its profundities. Among little children she is frightened to think what her idolatry of her own would have been. Her strong will, combined with anxiety of conscience—and this long after her supposed Atkinson emancipation from all sources of moral uneasiness—makes her fit only to live alone. "The older I have grown, the more serious and irremediable have seemed to me the evils and disadvantages of married life, as it exists among us."

To gauge the unhealthy foolishness of such miserable

brooding as this, it is only necessary to glance around, to fix our candid observation on any and every home in which two reasonably assorted people contribute to each other's happiness, and to the well-being of their children. To know how utterly it misrepresents Miss Martineau's actual character, we have only to study the pretty pictures these volumes afford of her Ambleside life—of her genial and hearty expertness as a housekeeper—of her imperturbable love of needlework—of her perfect friendliness with her servants—of her perpetual hospitality—of the good homely tact which attached the villagers of Westmoreland to her, as in earlier days her frank intelligence and unresting ear-trumpet had made her welcome in every London house worth visiting. Unless all this is mere fancy, Miss Martineau was the last woman in the world who need have feared or disliked the common chances of matrimony. But from my special point of view, it is more interesting to contrast with these acrid dribblings of her private pen the generous flow of healthy truth which was natural to her when the very same topic presented itself in the course of her literary avocations. In this paper I shall make but one extract from Miss Martineau's general writings; and I make it now. It is from her novel "Deerbrook," and it describes with a beauty that seems to me comparable with anything that is best in fiction the passion which in her Autobiography she scans with so dubious and sinister a regard:—

"There needs no other proof that happiness is the most wholesome moral atmosphere, and that in which the immortality of man is destined ultimately to thrive, than the elevation of soul, the religious aspiration which attends the first assurance, the first sober certainty of true love. There is much of this religious aspiration amidst all warmth of virtuous affection. There is a vivid love of God in the child that lays its cheek against the cheek of its mother and clasps its arms about her neck. God is thanked (perhaps unconsciously) for the brightness of his earth on summer evenings when a brother and sister,

who have long been parted, pour out their heart stores to each other, and feel their course of thought brightening as it runs. When the aged parent hears of the honours his children have won, or looks round upon the innocent faces as the glory of his decline, his mind reverts to Him who in them prescribed the purpose of his life and bestowed its grace. But, religious as is the mood of every good affection, none is so devotional as that of love, especially so called. The soul is then the very temple of adoration, of faith, of holy purity, of heroism, of charity. At such a moment the human creature shoots up into the angel; there is nothing on earth too defiled for its charity—nothing in hell too appalling for its heroism—nothing in heaven too glorious for its sympathy. Strengthened, sustained, vivified by that most mysterious power, union with another spirit, it feels itself well set forth on the way of victory over evil—sent out conquering and to conquer. There is no other such crisis in human life. The philosopher may experience uncontrollable agitation in verifying his principle of balancing systems of worlds, feeling perhaps as if he actually saw the creative hand in the act of sending the planets forth on their everlasting way, but this philosopher, solitary seraph as he may be regarded amidst a myriad of men, knows at such a moment no emotions so divine as those of the spirit becoming conscious that it is beloved—be it the peasant girl in the meadow, or the daughter of the sage reposing in her father's confidence, or the artisan beside his loom, or the man of letters musing by his fire-side. The warrior about to strike the decisive blow for the liberties of a nation, however impressed with the solemnity of the hour, is not in a state of such lofty resolution as those who, by joining hearts, are laying their joint hands on the whole wide realm of futurity for their own. The statesman who in the moment of success feels that an entire class of social sins and woes is annihilated by his hand is not conscious of so holy and so intimate a thankfulness as they who are aware that their redemption is come in the presence of a new and sovereign affection. And these are many—they are in all corners of every land. The statesman is the leader of a nation—the warrior is the grace of an age—the philosopher is the birth of a thousand years; but the lover—where is he not? Wherever parents look around upon their children, there he has been—wherever children are at play together, there he will soon be—wherever there are roofs under which men dwell, wherever there is an atmosphere vibrating with human voices, there is the lover, and there is his lofty worship going on, unspeakably, but revealed in the brightness of

the eye, the majesty of the presence, and the high temper of the discourse. Men have been ungrateful and perverse—they have done what they could to counteract, to debase this most heavenly influence of their life, but the laws of their Maker are too strong, the benignity of their Father is too patient and fervent for their opposition to withstand; and true love continues, and will continue, to send up its homage amidst the meditations of every eventide, and the busy hum of noon, and the song of the morning stars."

To say this is less painful—to say it is more beautiful—to say it is cleverer than the remarks on marriage in the Autobiography—is not much to our purpose. The view of the love aspect of life here presented, is also, in spite of its glowing style, more true to the facts of intelligent life. "*Deerbrook*" is not by any means a sentimental novel. It rather stands out as pre-eminently one in which fiction was made to serve the severest and most uncompromising moral purpose. There is not a line in it which is not truth itself. But here, in the midst of the author's somewhat arid course, she sees the rock which her true instinct tells her will yield sweet living water if she touches it with the rod in her hand. In her books it is always so. The scene is not always so lovely. The rock is not always so picturesque. The water does not always bubble forth with the same music, or make the same prismatic sheen, or dance from stone to stone with the same living joy, but her pen never passes by a pure spring of truth or moral beauty. No land is so iron-bound that she cannot lead forth from its forbidding heights at least some rivulet of moral refreshment. Her common-sense is strong and dry—her prejudices are vehement—she has favourite men and favourite doctrines. Leave her to herself, and we have seen how she will brood and groan. But set her on her literary pilgrimage, and the most lowering sky will brighten for her, the dullest prospect sparkle, the desert blossom and bear fruit. I will trust her caustic self-introspection, not one hour; her idols and prophets, not one

moment ; her literary instinct, always and wherever it leads her.

Of the working of that instinct little is said in these volumes, but much is revealed. Little is said, because, in all probability, Miss Martineau did not quite understand herself, and imagined her function to have been something rather different from what it was. Much is revealed, because she gives the frankest accounts of the way in which she undertook her books, and the way in which she wrote them. The general theory of her literary life, which she advances over and over again, is that she "had something to say, and, therefore, said it;" but this assumes somewhat more originality than can in strictness be allowed her. That she had always something to say, as she wrote, is true ; true is it also that it would have been difficult to find a subject on which the spirit would not have moved her : but it is not true that she was ever full of great ideas of her own which—as the phrase goes—must come out. Such originality as she had lay, first, in expression and illustration ; secondly, in being right when more brilliantly imaginative and inventive writers would have been wrong ; thirdly, in so rapid an assimilation, and so swift and forcible an utterance of new ideas, that they often seemed more truly hers than those of the persons who had first broached them. In fact, Miss Martineau was a magnificent journalist, and these are the qualities which make great journalists. She was not always writing on the topics of the hour, and it was only after she had made a name by her books that she wrote for a newspaper at all, but in all her work there was the firm practical criticism, the personal and public insight, the quick absorption and fusion of materials, the grasp of subject, and the hold upon intelligent readers, which are marks of journalistic power.

I well know how low the qualities of fine journalism are

rated by many persons of literary taste. There is so much bad journalism that it is not surprising the whole craft is underrated. Moreover, even the ablest journalists have sometimes lacked that conscientiousness which was one of Miss Martineau's best claims to admiration. Those, however, who have had opportunities of judging will agree with me that as nothing is more difficult than to obtain men who in readiness, information, style, and judgment, are really competent for this department of work, so no qualities except those of poets and philosophers deserve higher literary rank. The scorn affected by mere bookmakers for writers in newspapers is truly laughable when we consider the amount of brain-capital which suffices respectively for the two professions. It is a significant fact, that when Miss Martineau, after long being one of the most celebrated authors of the day, was offered the opportunity of writing in the *Daily News*, she eagerly seized it, brought to her new duties precisely the qualities which had always made her pen effective, and ever afterwards spoke and wrote of leader-writing as one of the most responsible and important functions of literature.

Of the prerequisites for all literary work requiring the capabilities and mental habits of a publicist, she was especially possessed of one—that of avidity and appetite for her work. There was probably not a languid half-hour in her life. Her interest in human affairs was constantly keen. To be interested was, with her, to watch, to watch was to understand, to understand was to explain and criticise, to explain and criticise was to produce literary work which will remain to all time a mirror of that most interesting period of our history covered by the names of Melbourne, Wellington, Durham, Brougham, Peel, and Cobden.

Moreover, in her journalistic type of talent, we see an explanation of the manner in which Miss Martineau, as it

were, sprang on a sudden into literary note. Had she been writing anonymously in journals, she might have remained unknown, but her first work took the form of economical tales, and the new idea, at first discouraged by James Mill, but afterwards admitted by him to have worthily succeeded, at once made her famous. But whence the power? To this question we have no reply. The Autobiography is not like John Stuart Mill's. It discloses no gradual enrichment and exploitation of mind. It tells no secrets of instruction and mental exercise. It suggests no growth. The moment Miss Martineau's first words appeared anonymously in print, her brother, unaware of her identity, pronounced that a notable new writer had appeared. Except that she did a little translating to improve her style, there is no trace in her recollections of training, however slight; and in these translations her instinct served her as well as usual, for she aimed solely at terseness, and acquired without difficulty the rare art of making herself briefly and concisely intelligible. Clear-headed, clear-sighted, and plain-spoken, with ready eloquence for succinct yet free expression, and elegance enough to give grace to her simplicity of diction, Miss Martineau stepped full-armed and in full prowess into the literary arena. She was born, not made. From the first moment her workmanship was irreproachable. She scarcely ever refused a literary task, and never made a false step in one that she undertook. Such a life may not have been quite so much on the heights of eminence as she thought it, but it was an infinitely useful life, and one that may encourage and dignify all who, however humbly, employ their powers of insight and criticism on the same level of achievement.

It was characteristic of her that very early in life she ceased copying out what she wrote. There was no use, she said, in copying if she did not alter, and if she altered,

she always had to change back, so she henceforth committed herself, as all practical writers for the Press do, to a single draft; but it was also characteristic that she saw no reason why Carlyle should turn out such bad manuscript—"copy" so chopped and changed, and turned and twisted—except that "the most marked mannerists of the day show most erasures and their proof-sheet most alterations." She herself had fallen, it appears, into mannerism, now metaphysically elliptical, now poetically amplified, and in one instance bordering on the Carlylish; but through all this folly, as well as since, having a style of her own (that is, finding expression by words as easy as breathing air), she always used the same method of writing, always making sure of what she had to say, and then setting it down without care or anxiety. It may safely be said, however, even as respects the most elevated passages of her own works, that these must have grown and flowered under her hand by a process very different from mere swift, straightforward scribbling of what had been previously resolved on, and if her personal sympathies had been more elastic, she would have perceived that such works as those of Carlyle, though less wise than her own, were so much more poetic and profound as fully to account for a more laborious method of production.

Similarly, Miss Martineau lays down very sound principles of work for all ordinary *litterateurs*. She says, very truly, that enormous loss of strength, energy, and time, is caused by people going to work at literature as if its labours were in all respects different from other kinds of toil. She is for intellectual punctuality and industry, and understands by these, not waiting for congenial moods, favourable circumstances, and so forth, but sitting down pen in hand and beginning at a good pace. She herself, she says naively, forgetting that from the nature of her work she always had

her subject before her, has suffered from indolence, irresolution, distaste, and absence of inspiration, but she always found herself in full train in a quarter of an hour; which experience convinced her that those embarrassments and depressions that she saw oppressing many an author were self-inflicted. The mood should be summoned, not waited for. A writer should be the master, not the sport of his ideas and impressions. So far as history writing, article writing, and critical writing of all sorts are concerned, this is probably quite just; but, after all, historians, critics, and article writers—even if they are as successful and original as Harriet Martineau herself—are, at best, of the second literary grade. Creation, whether it be of the poetic, the philosophic, or the fictional order, stands highest, and must have its own rules. No doubt it is absurd enough for mere *litterateurs*, however great, to give themselves the airs of martyr-inspiration; but it is as well to remember that great creative masters may not at all times have their exceptional faculties equally at call.

Miss Martineau did not fully recognise this. Her vast respect for the literary vocation seemed to equalise in her estimation most of those who followed it, and, indeed, Shakspeare among poets, as Canning among statesmen, appears to have occupied alone the summit of her adoration. On this subject she has a curious passage *apropos* of Charles Dickens's love of the drama, in which she confesses that nothing but Shakspeare was in her opinion worthy of the interest which many people take in plays. The faculty of intense admiration was not active in Miss Martineau until she was invited beyond the atmosphere in which she was accustomed to use her wings.

I suspect it was this that made her so easy a victim to the ideas which she embraced in lieu of religion, and so blind a devotee of the person she almost worshipped instead

of God. The extracts from her diaries and papers given by Mrs. Chapman in the Memorials, show, what would not be so apparent from the Autobiography, that during the first thirty years of her life Miss Martineau was a religionist of a very self-scrutinising, anxious type. It was an age of journal-keeping, when it was the custom for good people to write at the end of their day's entries such pious phrases as "May I never again" do this, "May I be enabled always to" do that, and "May I be preserved by grace from" the other. The habit suited Miss Martineau's "anxious conscience" at first, but did not chime in so well with her happier life when she became a successful and useful woman. She had early been troubled, like everybody else, with the mystery of evil, and was not very old when she saw in the doctrine of necessity a supposed solution of many difficulties. What difficulty of any consequence the doctrine of necessity solves—seeing that it cannot banish free-will either from our consciousness, from our language, or from the principles governing our treatment of others—it is not easy to see, though, as far as it recognises the general reign of law, we may freely concur in it. But Miss Martineau derived much sublime satisfaction from it, and was prepared by it to advance to an abnegation of the Supreme Being when a revelation to that effect should reach her.

It is too evident in all this that she was wincing under the comparative powerlessness of the mind in the spiritual region. She was so accustomed to understand everything the moment she clapped eyes on it, that she could not bear the existence of cosmic mysteries, and was ready to adopt any theory that was offered her by anyone, whom, from predisposition, or under any subtle influence, she supposed to know more of these matters than other people. It was in this mood that she met Mr. Atkinson, and became a Materialist and Atheist. She had a perfect right to do so.

Nay, if absolutely convinced, she was bound to do so. This would not be the place for any demonstration of the error of such beliefs. But we are entitled, as a Philosophical Society, to notice the extreme shallowness of the fancies by which Miss Martineau was captivated, and the absolute non-existence of the advantages which she presumed to derive from the Materialistic theory. We are also entitled to any melancholy amusement we may see fit to enjoy at the sight of so great a woman as Harriet Martineau at the feet of so small a man as her accepted teacher. The spectacle presented by the "Letters on Man's Nature and Development" was a very curious one—the poor, weak, mesmeric philosopher, figuring as well as he could in each letter as the instructor, while in each reply his able pupil compacted his ramblings into good, sound English; treated them as she would vague sketches of hints from a feeble editor for whom she was writing leading articles; told him what he meant; said it for him; and made everything lucid and ship-shape, except that not even Harriet Martineau could impart rationality to a book which, while it repudiated miracles, supported clairvoyance; and while it denied there was a God, asserted that Mr. Atkinson, the mesmerist, was a prophet.

Whether there ever was anything in Mr. Atkinson I do not feel quite able to decide. I can only say that I see nothing. Few of us are old enough to place ourselves with sufficient acuteness in the position of the people of thirty years ago, so as to pronounce what there was in the book that was new. The name of Atkinson, however, is not generally included among those of the first great apostles of Materialism; and as we now read his writings, they derive all their vividness from the joy they gave his one distinguished disciple, just as, whatever we may think of Lancelot's shield, there is no resisting the brightness on the face of Elaine. Reading the letters with our present lights,

Mr. Atkinson's share in them seems half trash, half truism ; and though we may admit, with Miss Martineau, the philosopher's clearness, especially after she had touched up his work, it was the clearness of a little puddle, which is very transparent because very shallow. In spite of all the boxes of precious adulation broken over the great man's head in these three volumes, there is not a line of his writing that indicates mental power, while his prevailing dialect has such a snuffle of self-satisfaction as to tempt one to add to Sterne's saying, that if the cant of religion is the worst, and the cant of criticism the most offensive, the cant of conceit is the most intolerable. In one passage of the book Mr. Atkinson is described by the pen of the celebrated, but in this Autobiography much snubbed, Margaret Fuller. She declares him to have a "fine instinctive nature," and says he was—

"A man of about thirty ; in the fullness of his powers ; tall, and finely formed, with a head for Leonardo to paint ; mild and composed, but thoughtful and sagacious ; he does not think, but perceives and acts. Sometimes stationary and acting in the affairs of other men, sometimes wandering about the world and learning, he seems bound by no tie, and yet looks as if he had relations in every place."

Discounting this eulogy, as all must who know Mr. Atkinson by his own pen, we may perhaps conclude that, as there are women's men in society, so there are women's men in philosophy, and that Mr. Atkinson was at this time one of them. In Miss Martineau's presence he could not open his lips to shyly confess that he had read an author she mentioned to him without her falling into raptures. Even she could not stand his hand-writing, but everything else was divine—or would have been if Mr. Atkinson had not expelled the very idea of divinity from the universe. When she has stood the dull steed upon his legs, and fed him from her own beautiful hands with the most fulsome flattery, and

whipped and spurred him into his fleetest amble by her most artful "instigations," she gazes in rapt admiration and looks around, with poor success, for sympathisers, grateful if she only discovers an affectionate friend or "an eminent writer" who did not despise the whole business from beginning to end. As for Mr. Atkinson, he took the matter quite seriously. He delighted his worshipper by vouchsafing to say that the spirit of her novel, "Deerbrook," was the spirit of his teaching, and he graciously described her as not an original philosophic genius, but a person with great artistic power and extraordinary ability to learn, with a still more extraordinary power of seizing on salient points and reproducing in a clear form what had been imperfectly stated by others.

When, after many years' brilliant and solid work, Miss Martineau retired from her position on the *Daily News*, he thus loftily but condescendingly congratulated her. "Now, my dear friend, you are one of us. I hail you among the noble band of lookers on." With this Pythagorean compliment Mr. Atkinson makes his exit from the scene, except that he is again seen in a letter written after Harriet Martineau's death, in which he claims to have anticipated Professor Tyndall, Dr. Maudsley, and Mr. Lewes, while he insinuates that Dr. Carpenter and Sir William Hamilton stole from him unconscious or automatic mind, and, being in a profusely thankful mood, rejoices that Professor Huxley has actually expressed an interest in mesmerism.

The extraordinary infatuation of Miss Martineau for this gentleman led to her alienation from her distinguished brother James. Whatever might be said of her brother's opinions, he was a wise man who could not see folly without laughing at it, or sciolism without piercing it with his rapier-pen, or a profane and shallow cosmogony without rebuking it in accents of grand severity. He neither lost nor forgot

his respect for his sister, but he administered to the "Letters," and especially to Mr. Atkinson in the pages of the *Prospective Review*, a most severe castigation. He showered strokes of satire on the element of credulity which contrasted so oddly with the book's uncompromising scepticism. "Through the whole exposition," he said, "flows a perpetual stream of physical miracle. The authors appear to live exclusively among people who see through brick walls, taste and hear across half the land; who will send you any given pain by the penny post, and write your whole biography from a bit of your old shoe; who have electric telegraphs laid into the future and into the past, and can report histories they never learned, and coming events that have made no signs of their approach." What was far worse than this banter, Mr. Martineau suggested that his sister, by a tyrannical exercise of mesmeric sympathy, had brought Mr. Atkinson's English to the standard of her own, and he proved this by quoting a previous writing of that gentleman which had almost every grammatical fault. "But enough," he exclaimed, "of this hierophant of the new atheism. With grief we must say that we remember nothing in literary history more melancholy than that Harriet Martineau should be prostrated at the feet of such a master; should lay down at his bidding her faith in moral obligation, in the living God, in the immortal sanctities; should glory in the infection of his blind arrogance and scorn, mistaking them for wisdom and piety; and meekly undertake to teach him grammar in return. Surely this humiliating inversion of the natural order of nobleness cannot last. If this be a specimen of mesmeric victories, such a conquest is more damaging than a thousand defeats." Perhaps it was not brotherly to write thus, but no other exception can be taken to it than that it came from James Martineau's pen.

His sister never forgave the appearance of this article,

but she is becomingly reticent on the subject in the Autobiography, and the Memorials do not convict the *Review* of injustice.

When we find such a woman as Miss Martineau treating the change in her views brought about by her acquaintance with Mr. Atkinson as a great emancipation, it is important to know from what she considered herself to be freed. She tells us that till then she had no idea of what life might be in freedom, vigour, and peace of mind. She attributes to her new views "the nightly mood which yielded her such lofty pleasure, under the stars and within the circuit of the solemn mountains." Something, it is clear, gave her the enthusiasm of serenity which Christians derive from their religion, and which Spinoza found in the sublimities of Pantheism. But what was it? and wherein was it so diametrically opposed to Christianity that she could not mention her earlier faith without hot repugnance? And why was her liberated soul lacking in the sweet spirit of Spinoza which enabled him, Pantheist as he was, to join in the simple religious services of the common people and to agree with nearly everything their pastors said?

The source of her satisfaction is very clearly indicated in the following passage:—"It is a short way up to the blank wall of human ignorance; but we can separate on our own side of the blank wall what is actually known from what is becoming revealed; and both from what we can never know. The wall itself is destined to be forced and the limits of ignorance to be set perpetually further back, while we can never be any nearer to knowing what our faculties are unable by their constitution to apprehend. While the disciples of dogma are living in a magic cavern, painted with wonderful shows, and the metaphysical philosophers are wandering in an enchanted wood, all tangle and bewilderment, the positive philosophers have emerged upon the broad, airy, sunny com-

mon of nature, with firm ground underfoot and unfathomable light overhead." I might retort upon this bold and telling *credo* that it is positive sciolists, not positive philosophers, who leave out of their reckonings the laws of mind and the proved necessities of the conscience. But I confine myself to the observation that, even if sound in itself, Miss Martinean's new faith in ultimate human knowledge could not entitle her in the mean time to placard her "blank wall of human ignorance" with lampoons and libels on the more religious beliefs of others.

A woman of such candour—as we are well instructed by the example of John Mill, who arrived at far healthier sensibilities from a less likely starting-point—should have felt no temptation to describe actual Christianity as representing God as "an unmitigated tyrant and spontaneous torturer," and the sweeter and nobler attributes of Jesus as "only deepening the opprobrium of the divine cruelty;" and she lived long enough to read in Mill's last essays how even in the absence of dogmatic faith in immortality the doctrines and hopes of Christianity presented to the greatest intellect of her time the ideal spiritual state which it was most tempted to covet. Unbelief one can respect, but where was the philosophy of this inveteracy against a faith which, as a matter of fact, yields to millions a peace passing understanding as greatly as that which Miss Martineau derived from hers?

At one time—when her book on Household Education was well received by Christian parents—she was on the verge of discovering that such persons could enjoy all her pen had to offer them without parting with their religion; but she passes the incident by with a sigh of egotistical gratulation, and gets no glimpse of the lesson it should have taught her. Although, according to her own creed, it could not possibly matter in what mood, so it were comfortable, a fellow-creature passed into senseless dust, she was positively miserable

because she had not in a very affecting instance thrust her ideas of personal extinction upon a dying man. He was a town missionary—"such a face—so full of life and happiness"—who idolised her, as indeed so fine and noble a spirit was worthy to be idolised. He fell into rapid consumption, and was dying, when it was suggested that his idol should write to him. She did. She sent him a beautiful letter and a sincere one; no doubt put her best and most loving tact into it—as, thank Heaven, many a woman can who is not a great author—and yet did not pretend what she did not believe. "There was not a word about the future, or of God, or even Christ," but, reaching this poor fellow on the last day of his life, it refreshed and solaced him, and he revived for a few moments in his dying torpor, and begged his wife "to tell all who loved him of 'this last flush on his darkness.'" Could any story be more beautiful? But what says the heroine? "This is dreadful pain to me. I feel as if I had told him a lie for my last words to him. It would have been hard and unkind not to write, and it was impossible to disturb his life at the last. Yet I feel that that letter did not carry my real mind to him, and does not to the many who are reading it." Even here there is a vein of gentle feeling; but years after, when scepticism and scorn had had more time to vulgarise her, Miss Martineau wrote that it was cheering to feel that her mind was now stronger, and that she "was released for ever from all danger of misleading missionaries or any body else by letters of sympathy under solemn circumstances which they would interpret by their preconceptions." I cannot tell how such expressions will be regarded by my audience. I can only protest in the name of philosophy against the supposition that free thought need be thus coarse-grained and ill-conditioned. No wonder her friends found her new doctrines "vinegar mingled with gall."

Let us take another example of her jaundiced condition

of mind. She heard the "Messiah" performed at the Coronation, and this, of course, was long before she met Mr. Atkinson or embraced his opinions. But she was already on the declining plane, and disposed to carp at other people's devotions. She considered the oratorio saddening and full of shame as an act of worship—ridiculed the representation of the Supreme Being as King of Kings—and winced at the attribution to the Great First Cause of military and aristocratic rank and regal prerogative after what she considered a "Jewish or Heathen" fashion. She must have known perfectly well that by the growth of religion (whether under inspired direction or not is immaterial to the argument) the ancient Hebrew phrases had lost the narrow meanings in which they had been used—if they had so been used—by a primitive people, and that not a person who now heartily joined in them did so otherwise than in the loftiest and most spiritual sense. Is it philosophical to ignore the noble and expansive belief into which a rudimentary faith has grown, and to tie a modern and enlightened generation down to any small or too literal conceptions which the elastic outline of rites and phraseology now amply sufficing for the grandest ideas may originally have only just enclosed? Miss Martineau was a warm admirer of Comte, but she had too little of his tolerant historical appreciation. The only thing she retained from her religious education was its narrowness, and the freer she thought herself the narrower she became.

It was easy to express the change which had passed over her in the technicalities of the positive philosophy—which always becomes a jargon when used by real people in reference to real stages of their mental history—and accordingly there are several passages in which much is made of her having got out of the metaphysical region; and if this had been merely rejoiced over as an advance in theological theory, it would not have been a proper subject for us to discuss in

this Society. But to understand Miss Martineau's feelings, we must note her less formal and more expressive utterances, from which we gather that what delighted and emancipated her was not a mere approach to or even attainment of abstract truth, but the getting rid of free-will and moral choice. Materialism taught her that the whole action of the human being was automatic, and the consequence, as she expressed it, was that "my friend and I" in "our emancipated maturity agreed that not for the universe would we again have the care of our souls upon our hands."

Surely this was a strange—nay, an inconceivable—subject for congratulation. Understand by the care of one's soul the mere escaping from an obscure and superstitiously conceived future perdition—or grant that a virtuous person may escape responsibility for his soul on a principle which will not also license a wilfully vicious person in the indulgence of immorality—and we might comprehend Miss Martineau's glee in making believe to be irresponsible; but the latter supposition is impossible, and the former, though a view of salvation, is not that which any religionist worth arguing with adopts. Although by a fiction of the mind she may have got rid of certain stereotyped anxieties, such a woman as Miss Martineau could never have obtained any satisfaction from not having her soul to take charge of if she had seen in herself the corruptions and shortcomings she knew to be in her moral inferiors. That she composed her moral philosophy on principles which, unless we juggle with words, could only work out tolerably in natures like her own, proves the fallacious character of her new content.

A South Sea islander, bathing in warm seas, and living on luscious fruits, might be capable of such satisfaction, because insensible of evil as of good. But Miss Martineau was so rigidly pure that even Thackeray's "Vanity Fair" appeared to her too tolerant of evil. She was so energetic

and benevolent that in the height of her fame, when a letter was posted addressed to the "Queen of Philanthropists," the postmaster superscribed it, "Try Miss Martineau." As long as she could move she continued the most devoted labours for the good of the people among whom she lived. And what did she aim at? Treating them as children? Shielding them from all temptations? Fencing them round from evil? By no means. Her endeavour was to arouse their moral sense, to make them choose the better part, to induce them to prefer good habits to bad. Pray what is this but persuading people to take good charge of their souls? For though, in a narrow sense, such phrases may refer to a mere avoidance of prospective perdition, the Christianity which Miss Martineau despised coincides with the philanthropy she practised, and differs from the false philosophy she fancied she believed, in making moral perfection the highest object of all human endeavour, and moral improvement the surest route even to material happiness.

She might think she had got out of the domain of moral embarrassment because a trick of thought, taught her by a rather silly but so far useful, gentleman, had extirpated morbid preoccupations which her own much greater wisdom had been too much engaged otherwise to solve. But there was no change in her writings or in her life, and hardly a word fell from her pen or lips that did not tend to stimulate others to a right, a persevering, an ardent exercise of that moral choice which she found a strange peace in believing was impossible either for herself or anyone else.

Such are the inconsistencies into which even the greatest and most accurate minds must be betrayed if, instead of acquiescing in the insolubility of the problem of human responsibility, or treating it apart as a subject for metaphysical ingenuity, they attempt to apply in any sort of practice a theory which shallowly pretends to clear up the mystery.

Happily such cases are rare, and they are never complete. Here is a lady pretending that none of us have any choice how we act. But in one page of her Autobiography she nearly explodes with suppressed anger because Lord Lansdowne shows civility to her as an author and not as a lady. On another she flies into ecstacies over the rare and active virtues of her friend Mrs. Chapman. On many others, with true pathetic indignation, she fires up amidst tears at the shameful treatment that broke the heart and cut short the life of Lord Durham. And on almost every page she exhibits a lively passion for people who do well or against people who do ill, which is manifestly a preposterous disturbance of her philosophic quiet, unless those whom she blames or praises had free choice in their conduct.

A quibbler may indeed reply that Miss Martineau could no more help being indignant than the wrong-doer could help doing the wrong; but the sufficient answer is that Miss Martineau's indignation is, in many cases, justified by abstract principles of right which we all acknowledge, yet would not be justified in so doing if it were not assumed that the acts done were wilful and responsible. Blame and moral judgment—still more the idea of righteous punishment in every form—are intruders upon the principle from which Miss Martineau supposed she derived her happiness; but if they are expelled from human life, the residue is an inconceivable chaos.

But, in truth, her supposition that her happiness was thus derived was entirely fantastic. To those who can read the woman through the veil of her Autobiography it is evident that what gave her relief was that—*post hoc*, not *propter hoc*—after accepting Mr. Atkinson's formula as a sort of charm to mumble when she felt low spirited, she gave up the cruel and fretting self-introspection which had been the bane of her existence. She had never needed, though she had

often worried herself with the check or spur of self-examination. She would have been a female Wellington in point of natural devotion to duty as a matter of course, if she had been as free as the Iron Duke from self-consciousness. But in one form or other this miserable quality passed into habit plagued her till she was nearly fifty, and when it ceased to annoy her she stored it up for her friends, for whom there is in these volumes a whole reservoir of vexation. A book one-half of which is rendered gloomy by gratuitous sentimental troubles, the other half much deformed by shrewish censoriousness, and the whole vulgarised by an offensive assumption of spiritual deliverance and superiority, which will not bear a moment's examination, can hardly be considered a fitting monument of a life so noble, so full of good, so free from public errors as that of Harriet Martineau.

If it is necessary for me to defend the occupation of so much of your time with matter of a *quasi-religious* quality, I plead that the main substance of feeling in the Auto-biography is an enthusiasm for the extinction of religious hopes and influences. That enthusiasm I should take to be at once anti-human and unphilosophical, even if religious hopes were vain, because religious influences are certainly excellent, and contribute more than anything else to human well-being. Miss Martineau's right to her opinions no one will question, but it is necessary, in the face of formal statements by so eminent a person, to deny, first, that she held her opinions consistently; secondly, that they could be held with practical consistency by any intelligent moral being; thirdly, that it was from those opinions that she really derived the felicity of her later years; fourthly, that any but the most delusive comfort can be got from the particular opinion on which she laid most stress; fifthly, that any workable system of moral philosophy requires, or that any human interest, intellectual, moral, or social, can be pro-

moted, or any practical human difficulty avoided, by the abandonment of Christianity; and lastly, that any perceptible progress has ever been made by anyone towards the clearing up of the mystery which surrounds the conscious freedom of a large proportion of human volitions, much less towards such a disproof of that freedom as would destroy moral responsibility. These protests are more essential in the cause of political and moral philosophy than in that of religion. Religion will always take care of itself, but the advances of mankind in the purest intelligence and conscientiousness, in lofty principles of citizenship, and in true liberality of opinion, will always be hindered so long as hostility to religion is vulgarly considered the attitude to which the highest enlightenment is prone.

Having acknowledged the somewhat painful and lowering impressions which the Autobiography and Memorials have produced, the best thing we can do is to rehabilitate from the brighter pages of the book that conception of the true Harriet Martineau—if I may employ a useful sporting phrase for which there is, at any rate about boat-race time, good University authority)—Harriet Martineau in her “public form.” For this purpose we may have recourse to the glowing descriptions of her rapid success at the first onset in London—when, true to the instinctive type of her talent, she found she had been writing good political economy without knowing it—and the fact that from that moment the demand for her work never ceased, and its effectual quality never deteriorated. Like most people who have faculty as well as desert, she honestly enjoyed being made a fuss with, and her Autobiography abounds with frank records of the pleasure she experienced in being buzzed around by some of the greatest men of the day. It also affords many explicit testimonies to her high usefulness and distinction.. Brougham snarled over the complete eclipse of the grand Whig Society

for the Diffusion of Useful Knowledge by Miss Martineau's single endeavours. Lord Jeffrey would have gone a long way to "kiss the hem of her garment, or the hand that delineated her glowing and lofty representations of purity and noble virtue." The energetic and patriotic government of Lord Melbourne, full of great projects of improvement, came incessantly to this clever young woman of thirty for counsel and for countenance; and when she had grown older, and was moved to much characteristic suffering by the personal suspicion and hostility between Peel and Cobden, it was to her private remonstrances the great men listened. Peel made amends, for which Cobden had long waited, and sent Miss Martineau a marked newspaper with his autograph, containing a report of what he had said, while Cobden, ill and weary, but delighted, stayed up at three in the morning, after the House, to write her a little scrawl to the effect that he could not sleep till he had sent her the blessing on the peace-maker; that his mind was eased of a load which had burdened it for many miserable years; and that now he should be a new man. O'Connell, convinced that Ireland suffered from vulgar and violent advocacy, did himself and Harriet Martineau honour by begging that one who had proved in America how well she could understand another country would study and report upon Irish affairs upon the spot. Charlotte Bronte shared few of her opinions, but cherished "the highest respect for her union of the highest culture with the nicest discharge of feminine duties, and for her person, practice, and character in every way." Sidney Smith pronounced her "safe" when she had gone through such a season as no girl ever knew before, and "kept her own mind, manners, and voice," and on another occasion went higher, and called her "a true heroic nature." Carlyle curiously observed that she was the only instance he knew of clear activity being compatible with happiness. Guizot made

a biography of her the first of a series he was issuing as Minister of Public Instruction. Mr. Atkinson said, oddly enough, that she was a master mind, and sat at the feet of no one. Mr. Forster, during the American Civil War, declared that it seemed as if Harriet Martineau alone was keeping this country straight. Florence Nightingale, in spite of her friend's atheism and her own fervent Christianity, wrote that Miss Martineau had the deepest religious feeling she had ever known, and that to the last it showed itself "in the sense of good working out of evil into a supreme wisdom, penetrating and moulding the whole universe, and in the natural subordination of intellect and the intellectual purposes and intellectual self to purposes of good."

Among these testimonies we come upon perfectly delightful pictures of the frank and high-toned hospitality of The Knoll at Ambleside, and also upon graphic descriptions of Miss Martineau's appearance and ways. When Hawthorne saw her she was a large, robust, elderly woman, plainly dressed, but with such a kind, cheerful, intelligent face that she was pleasanter to look upon than most beauties; the most continual talker he had ever heard—really like the babbling of a brook, but very lively and sensible; and all the while she talked moving the bowl of her ear-trumpet from one auditor to another, so that it became quite an organ of intelligence and sympathy. If you had any little remark to make you dropped it in, and she helped you by the delicate appeal of the trumpet as she slightly directed it towards you, and if you had nothing to say, the appeal was not strong enough to embarrass you. "All her talk was about herself and her affairs, but it did not seem like egotism, because it was so cheerful and free from morbidness." This woman atheistical? Hawthorne would not think so. In spite of her lack of beauty, Mrs. Chapman found her presence from the first attractive and impressive, and delighted especially in

her rich brown, abundant hair, and her eyes light and full, of a grayish, greenish blue, varying in colour with the time of day or with the eye of the beholder, steadily and quietly alert, as if seeing something where another would have found nothing to notice. "You might walk the livelong day in any city streets, and not meet such a face of simple, cheerful strength, with so much light and sweetness in its play of feature." "Her one great gift," says her memorialist, "was utterance: not rhetoric, not elocution, not eloquence, not wit—though her talk was full of short corner touches—but the faculty of rapidly communicating thought and feeling." We can well imagine the pleasure with which her warm friends, such as Macready, when she had retired to the Lakes, "looked with wonder at the brown hue of health upon her face, and saw her firm and almost manly strides" as she walked about to show them the beautiful sights among which she lived, and amid which, soon after, she began—but mistakenly—to expect very early to die.

The delightful activity of this great woman's mind, and her almost universal sympathy with all subjects of human interest, is most happily exhibited in her criticisms of her contemporaries. Macaulay got least justice from her. He was too absolutely a Whig, and she saw nothing in him but irresistible speech and a brilliant power of historical romance. To Bulwer she was kinder. If she quizzed him as he sat on a sofa like a Sultan being petted by beauties, she saw he had "insight, experience, sympathy, letters, and an irresistible impulse to utterance and industry," and possessed "one of the most promising natures of her time." His "friendly temper and simple manners often left her mourning that such a being should allow himself to sport with perdition," for he "had the makings of a good man." Of Mill she has little to say, except that his voice was feeble and his Autobiography melancholy. She enjoyed Sidney Smith's wit, and

detected what was less commonly observed—his seriousness. The earlier Carlyle lives in these pages in many a vivid trait, and always amid a halo of kindly admiration. Lord Houghton is a prime favourite, for good and true grounds assigned. Babbage figures well, especially when patiently enduring the questions of a lady who wound up by asking him whether, if he put the wrong question into his calculating machine, the right answer would come out. Lyell's Scotch prudence is seen giving way to natural geniality and an expanding liberality of opinion. Allan Cunningham was precisely the human example she had most wished to see—a hard-handed workman, with letters and poetry opened to him by the life of books. Croker she justly hated. Lockhart, upon much provocation, she cruelly compassionated. Moore she freely despised. Mrs. Barbauld she deemed a genius. Miss Bremer she coldly patronises. Margaret Fuller she resolutely plants her manly foot upon, and seeks to crush. For Mary Wollstonecraft she calmly makes allowances on the ground of constitution and singular environment. Thackeray she could not believe in till she read "Esmond," when she saw his "rich, ripe wisdom, and the fertility with which he opens glimpses into a multitudinous world as he proceeds." But in spite of Laura Pendennis and Esmond's "dearest mistress," she gathered from their author's manners, as from his books, that he could never have known a good and sensible woman. She enjoyed her face-to-face intercourse with Dickens, and took strong delight in some of his books, but she missed the pure broad daylight of actual existence both in his scenery and characters, and when she had done much work for him, parted from his periodical in just disgust because he proved himself so bad a Liberal as to pander to Protestant prejudices by gross and reckless articles in its pages.

Scott's "Bride of Lammermoor" she re-read with asto-

nishment that she could no longer enjoy it. In Jane Austen she found two touches, and only two, of pathos. Of immorality in novels she wisely said that tales were not to be judged by their fitness for children ; that she objected to no real subjects into which pure moral feelings of any kind could enter ; and that the morality or immorality of fiction depended on whether its spirit was pure and benign, whether immorality was treated with foul gusto or with a mere view to delineation. She was in time to see the weird face and hear the dreamy voice of Coleridge, and thought his utterances about equal in wonder to the numerical results of Babbage's machine. Wordsworth does not appear to advantage in these volumes, because Miss Martineau only dwells on her poet-friend's least imposing characteristics. Of the statesmen of her time Peel was her favourite. For the Whigs she had no pity. Nor for Edward Everett of Boston. For Charles Sumner she had a great deal. But Miss Martineau's pity was by no means "a sweet boon."

There are very sharp sayings in this book, sharper sayings, let us hope, than were often dropped into the world-famed ear-trumpet. Nothing more acrid has been written than Miss Martineau's bitter satire on Unitarianism, a piece of writing not suitable for notice here, but well worth a glance from those who are interested in the differences of English sects. Few better hits have ever been made than the remark about Robert Owen that he was not the man to think differently of a book for having read it. And what a pregnant *mot* this is—a chance line in a diary : "Odd sometimes to see thoroughly vulgar people. It enlarges one's ideas." The good things, as distinguished from merely bitter things, are of course much more numerous. There is a criticism, wise on the whole, though very stern, on some of Dickens's humanitarian fiction, expressed in a wish that he would abstain from a set of difficult subjects on which all true

sentiment must be underlain by a sort of knowledge which he had not. From old Miss Berry, with her startling bad language, through the whole range of her seniors and juniors, Miss Martineau has something lively to say of almost every personage visible or knowable while she was in society, and though she seldom kindles into warmth, when she does so, as in the case of Lord Durham—the most unfortunate statesman of Parliamentary times—there is a depth of feeling which saturates with true pathos subjects commonly thought ungenial or out of the atmosphere of tender emotion.

Miss Martineau is not to be understood, however, by those who cannot appreciate a noble enthusiasm on public questions and susceptibility on public affairs as keen and sensitive as ordinary people cherish on matters of self and family and friendship. Proofs of this, which glow abundantly on these pages, will be regarded differently by persons of different opinions, but everyone with a quickened and cultivated sense of citizenship will admire, without reference to opinion, the public zeal with which the heroine of the Autobiography and Memorials was always aflame. We see it in her sentiments on American slavery; in her mountain-moving faith in political economy; in her admiration of Peel—as her History revealed an earlier worship of Canning; in her fierce hostility to Russia, which in her time was still what Continental Liberals even now believe it to be, the sworn enemy of liberty and democracy; in her uncompromising aversion from all projects for making people good by Act of Parliament, or, as she phrased it, undertaking to provide by law against personal vices; in her adoption of the doctrine—all political economist and anti-Socialist as she was—that a deep modification of the institution of property, certainly in regard to land, and probably in regard to much else, must be an element in the progressive improvement of society; and in her warm advocacy of the movement chiefly

identified with the name of Mrs. Butler. Whatever may be our judgment on this last topic, the biographer of John Grey of Dilston, and the autobiographer of Harriet Martineau might well be proud of and ought to be honoured for their common heroism ; and the friends of Miss Martineau may be permitted to cite her hostility to the Acts these ladies opposed together as a proof that her materialism had not indurated her moral sense, or atrophied or coarsened her spiritual fibre.

So far as the book is a history of Miss Martineau's life-work it is singularly barren, just because that life-work was of a kind not lending itself to narration. All you perceive is that here was a woman of commanding mind, penetrating insight, fluent pen, and almost infallible judgment, who was constantly finding new themes on which to instruct the public—for whom publishers and editors were always eager to afford channels of influence—whose ready tact and firm, quick apprehending glance enabled her to surround herself as surely and promptly with the best material as a Frederick the Great would do in war—and whose calibre of mind enabled her to appropriate as if by inspiration, and to use with straight aim and success, and always in the cause and for the good of the public, the best extant knowledge and theories.

Meanwhile, if you will listen to her—and you cannot help it—she will tell you, now her potent public personality has disappeared from our midst, whom she knew and what she thought of them ; who libelled her and who praised her ; whom she visited, and why she would not accept civilities from Lord Lansdowne. She will tell you how she expected to be treated as a lady and not as an authoress, and yet did not like to be talked to as a woman and different from a man ; how kind old Samuel Rogers and “contradictious” Henry Hallam were to her, and how she shamed Dean

Milman at a breakfast table by arguing that if a man had no heart he could not be happy. You will find her shedding tears over Comte as she translates and condenses his philosophy; curing herself of what she considers the Christian foible of regarding illness as a special moral discipline; never tired of detailed and local philanthropy; always recurring to fancy needlework as a solace and occupation; managing her house to perfection; the friend and confidant and gossip of her servants, who evidently stayed with her a long time and became sincerely attached to her; and altogether leading a vigorous, various, strongly-featured, and, in a good sense, wilful private life—a life with some caprices in it, but no caprice that did not own the check of conscience and assume to be defensible by reason.

If you want to laugh at her a little, observe how seriously she resents Petruchio's treatment of Katherine, and, by implication, condemns Shakspeare's "Taming of the Shrew;" or notice how she thinks a new plot for a fiction an impossibility because she cannot think of one; or listen to her strange argument, that though a philosopher may cite "the fair humanities of old religion," or quote the Pagan classics with gusto, he must not enrich his language with Scripture phraseology. But on the whole you will be little disposed to make merry with the foibles—happily till now only guessed through a veil of seclusion, tinged with a supposition of eccentricity—of so great and useful a woman, who knew and said it was her mission "to teach principles," and who, in her work for the public, fulfilled that mission as no woman and few men have ever done before.

Rather attune your minds for a moment to the spirit of the simple life she sketches so beautifully in her account of her latest days of work—work done, as she thought, under the very shadow of death, but with a serenity never clouded, and an enjoyment that lost neither its avidity nor its

nobleness. Her letters and her daily leading article occupied her morning, and "there was time for exercise and neighbourly business before dinner." Then there was her favourite "womanish" resource—the adjective is hers—of wool-work, many a square yard of which was invisibly embossed, she said, with thoughts wrought in under the various moods and experiences of a long series of years. In winter evenings she lit her lamp with alacrity and dreamed over her needle-work till the second post brought her a London newspaper and reminded her of tea. After tea, if there was news of the war, she called in the servants, and the great atlas was brought, and they all studied together the chances of the campaign. Then "there was an hour or two for Montaigne, or Bacon, or Shakspeare, or Tennyson," or "the last new book from London." And when the house and neighbourhood were asleep, there was half-an-hour on the terrace, or, if the weather was too bad, in the porch—whence she seldom came without a clear purpose for next morning's work. "On my terrace," she writes, "there were two worlds extended bright before me, even when midnight darkness hid from my bodily eyes all but the outlines of the solemn mountains that surround our valley on three sides, and the clear opening of the lake on the south. In one of those worlds she saw the scenes of her travels—"now the magnificent coasts of Massachusetts in autumn, or the flowing swamps of Louisiana, or the forests of Georgia in spring, or the Illinois prairie in summer, or the blue Nile, or the brown Sinai, or the gorgeous Petra, or the view of Damascus from Salahiey, or the Grand Canal under a Venetian sunset, or the Black Forest in twilight, or Malta in the glare of noon, or the broad desert stretching away under the stars, or the Red Sea tossing its superb shells on shore in the pale dawn." This was one world that "came up into light" amid the darkness "at her call." The

"other and finer scenery" was of the world of science "only beginning to be explored," the "imagery of whose glorious hierarchy" had been impressed upon her by her long study of Comte. It was truly, she said, "an exquisite pleasure to dream, after the toil of study, on the sublime abstractions of mathematics, the transcendent scenery unrolled by astronomy, the mysterious invisible forces dimly hinted to us by physics, the new conceptions of the constitution of matter originated by chemistry, and the inestimable glimpses opened to us of the nature and destiny of man by the researches into vegetable and animal organisation." "Wondrous beyond the comprehension of any one mind was the mass of glorious facts and the series of mighty conceptions laid open, but the shadow of the surrounding darkness" rested "upon it all."

From the peopled and fancy-painted shadows of that darkness—destined withal to clear away at the dawn—we can imagine her stepping back into the lingering light of the home her memory hallows, with eyes drinking rapidly in the signs of life and duty and friendship which she loved even better than the poetry of great silences and shadows, and laying down her head, at length for the last time, on the pillow of well-earned repose. She was a great woman, in spite of the littlenesses of this book, and if any may gainsay her greatness, it must be those who have not lived for mere comfort, or even for the mere personal peace of a religious life. It is easy to wish that she had been free from, or had even concealed for ever, the frailties of her temper and the infatuations of her poorer hero worship, but it is not easy to lead a life so proof as hers was against self-reproach, or so purely dependent for its happiness upon the highest joys. With less indulgence of an egotism which tended to become sour, and a humbler apprehension of mysteries which no human being can either ignore or rationally presume to have

solved, Harriet Martineau would have been entirely worthy to the last of the majestic eulogium of Monckton Milnes :—

“ Because the few with signal virtue crowned,  
The heights and pinnacles of human mind,  
Sadder and wearier than the rest are found,  
Wish not thyself less wise nor less refined.  
True that the small delights that day by day  
Cheer and distract our being are not theirs ;  
True that when vowed to virtue’s nobler sway,  
A loftier being brings severer cares :  
Yet have they special pleasures,—even mirth  
By those undreamt of who have only trod  
Life’s valley smooth ; and if the rolling earth  
To their nice ear have many a painful tone,  
They know man does not live by joy alone,  
But by the presence of the power of God.”

NOTE.—It did not fall within the scope of this Paper to discuss Miss Martineau’s state of health from the time when she resorted to and believed she was greatly relieved by mesmeric treatment; but I cannot help expressing regret that Mrs. Chapman did not see fit to include in her volume of Memorials some record of physical facts, ascertained since her friend’s death, which bear strongly on this subject, once discussed with much excitement and acrimony. The supposed cure of Miss Harriet Martineau, in 1844, by mesmerism has been clearly accounted for in a communication made to the Clinical Society of London by the eminent T. Spencer Wells, F.R.C.S. (See *British Medical Journal*, May 5th, 1877.) Inquirers may there learn the history and course of the oppressive internal disease under which she laboured for probably between thirty and forty years—a disease which, in its natural progress, passed through a period of alleviation and apparent cure; which, further on, might probably have been successfully eradicated, but which was, in fact, permitted to run its course. The observation has naturally occurred to several persons who have become aware of the true state of the case, that it to some extent explains much in her later life, and in the Autobiography, which those who most admired her most lament.

## POPULAR ERRORS ABOUT POISONS.

By EDWARD DAVIES, F.C.S.

THERE is no form of crime which so powerfully affects the imagination as poisoning, which excites such terror, or stirs up such violent indignation against its perpetrator. To take away human life by deeds of violence is in comparison a matter of much smaller guilt, for we may find some excuse for the man who, at all events, gives one a chance of resistance, and who may act on the spur of revengeful passion, or who is carried by fear of detection or capture to kill his victim. But poisoning, by its very nature, excludes the idea of want of premeditation ; there must be the procuring of the poison, the patient waiting for a favourable opportunity for its administration, the calm watch over the action of the deadly agent, perhaps the repetition of all this from a first failure. Then the defenceless state of the victim, who unconsciously receives from professedly friendly hands the deadly draught or poisoned food, or is unknowingly made the instrument of his own destruction, makes us furious against this violation of every principle of manliness and fair-play, deprives the poisoner of every spark of sympathy, and makes us consider him as an enemy of the human race, at whose detection and punishment every one rejoices. This creates the intense interest which poisoning cases excite, and leads us to devour every detail of the trial. I need only allude to the Palmer case, not to speak of more recent trials, to prove that poisoning cases arouse the public mind far more than other kinds of murder. We all feel that against this peril all precaution is in vain, and, therefore, we feel anxious

that the guilty shall not escape, and that certain detection shall render the crime too dangerous to practice. This also helps us to understand the panics which in old time were caused by the explanation which was given of epidemic diseases of an unknown type, when poisoning of the wells, or the scattering of poison in the streets, was at once set down as their origin, and innocent persons were ruthlessly murdered as being the diabolical agents if they were seen doing anything which a frenzied populace thought suspicious. Fiction has seized upon this, and Eugene Sue, in his *Wandering Jew*, has vigorously painted the insane terror caused by this idea. Sudden deaths were generally set down to poison, and many characters of history have been held up to reprobation as removing their enemies by this means, which more knowledge of science is now showing was probably undeserved.

Terror and unreasoning panic have produced an abundant crop of erroneous opinions respecting poisons, and as some of these have fallen under my own observation, I have thought it not unworthy of the consideration of this Society, how these have arisen, and how they may be removed. I may remark that I have found a great dearth of information in books on this subject, and must crave your indulgence if my remarks lack the fulness of illustration which they require, and also for drawing from works of fiction examples in justification of my statements. Fiction is, indeed, almost the only form of non-scientific literature in which allusion is made to poisoning, and I have, therefore, not scrupled to use it. Here there is almost an excess of material, and if I have only made use of two works, one by a popular English, and the other by a world-renowned French, author, it was because these gave me sufficient illustrations of this type.

1.—That every poison has its antidote.

An antidote is something given to counteract the effects of a poison, and one fallacy of very early date was that for every poison Providence had provided an antidote which, taken at almost any time before a fatal termination, would arrest its action and restore the patient to health. In order that this intention should not be defeated it was also an article of faith that the two were invariably to be found in the same neighbourhood, and the only thing wanting to secure the desired immunity from death was some mark whereby the antidote could be recognised. Unfortunately, this link is wanting, and we now know that antidotes, in the sense given above, are, alas, almost unknown.

Shakespeare, in *Romeo and Juliet*, says:—

“ Within the infant rind of this small flower  
Poison hath residence, and medicine power:  
For this, being smelt, with that part cheers each part;  
Being tasted, slays all senses with the heart.  
Two such opposed foes encamp them still  
In man as well as herbs.”      Act ii., Scene 8.

Again, the close connection between the bane and antidote is exemplified in the following extract from Paris's *Pharmacologia* :—“ For the same potent reason were the hairs of the rabid dog esteemed the true specific for hydrophobia.” From this, I suppose, we get the phrase, “ a hair of the dog that bit you.” Perhaps the most perfect example was that the ashes of a witch, thoroughly burnt at the stake, were a certain defence against witchcraft. No one who has read the fiction supplied by instalments in cheap publications can have failed to meet with the villain who seeks to remove his enemy by dropping some colourless liquid into his food or drink, and who is as invariably checkmated by some mysterious individual who detects his nefarious designs ; and when the poison is well on its deadly way, gives a few drops of another

colourless liquid, and restores the hero or heroine forthwith, only to meet with another danger "in our next."

The strength of this belief may be gathered from the long life which that extraordinary mixture known as "Theriaca Andromachi," said to have been invented by Mithridates, King of Pontus, and discovered among his papers, has had. Galen says, that whoever took a proper quantity in the morning was insured from poisons for the whole of that day, and Celsus asserts that Mithridates himself had so fortified his constitution against poisons, that when he wanted to kill himself by poison none would produce any effect. In Celsus it contained thirty-five ingredients, Andromachus increased the number to seventy-five, and it still survives in the French Pharmacopœia, but reduced to sixty ingredients, among which we find a kind of clay, dried vipers, bread crumbs, gum-arabic, castor, opium, and a host of harmless herbs. It may be asked, What is the real state of our knowledge of antidotes? When a poison is administered, of course for a shorter or longer time it remains in the stomach before absorption into the system takes place. This may be almost instantaneous, as in the case of concentrated prussic acid, or it may take time, as when arsenic in the solid form is employed. Probably no poison can act unless it is dissolved either before administration or by the contents of the stomach. At this stage we may, in some cases, render the poison insoluble in the stomach, as bichloride of mercury by albumen, oxalic acid by a lime compound, arsenic by freshly precipitated oxide of iron, and then, by some powerful emetic, or by mechanical means, remove the injurious substance before it can become re-dissolved. So far we may be said to possess antidotes to many poisons, but this is not the sense in which the term is usually employed. An antidote, in the popular sense, is something which will counteract the action of the poison when it has entered the system in quantity sufficient,

if unchecked, to produce death ; and of such antidotes we possess indeed few, and those principally to poisons of vegetable origin. Morphia is to some extent an antidote for strychnine, and by the careful balancing of one poison against another life has sometimes been preserved. Strong coffee, and possibly caffeine, might in like manner neutralise the action of morphia. Curare has been suggested as an antidote for strychnine, but in Watt's *Dictionary* it is stated that it is ineffectual. And that is about the state of our knowledge.

2.—That formerly there were poisoners who could produce effects far in advance of anything known at present. Paris says, "Nor shall I consume the time of the reader by attempting to expose the absurdity of those fearful powers with which ignorance, terror, and imposture have invested certain poisons—a subtlety so extreme as to defeat the most skilful caution, and a virulence so unmanageable as to be capable of the most accurate graduation; so that while the former attribute was believed to ensure their deadly operation, although exerted through the most secret and least suspicious medium, as that of gloves, tapers, or letters, the latter was said to enable the accomplished assassin to measure the allotted moments of his victim with the nicest precision, and to occasion his death at any period which might best answer the objects of the assassination.

"The abandonment of such notions may be considered as one among the many advantages which have arisen to medicine from the cultivation of phynology."

So wrote Dr. Paris, in 1829, but how far are those expectations realised. I take up Miss Braddon's *Trail of the Serpent*, and find one character, speaking in presence of a chemist and mystery-man, says:—"A tender pressure of the traitor's hand, a flower or a ribbon given as the pledge of love, the leaves of a book hastily turned over with the tips of moistened fingers, people had such vulgar habits in those

days, and behold the gentleman died, and no one was any the wiser but the worms, with whose constitutions aqua tofana at second-hand may possibly have disagreed." And then the mystery-man, for one can find no other name for that wonderful being whom we meet in sensational novels, who is an astrologer, chemist, spiritualist, with a strong dash of the necromancer, who knows everybody's secrets, and sneers at the clever villain who is so shallow to his transcendent intellect ; he says of himself, " Nothing more easy, madam ; I have only to raise my hand, to wave a handkerchief medicated in the manner of those of the Borgias and Medicis used of old, before your face, to scatter a few grains of powder into that fire (N.B., the fire was in a grate with, we may presume, an ordinary draught) at your feet, to give you a book to read, a flower to smell, and you do not leave this room alive."

There is no doubt that it was thoroughly believed, in the days when this idea arose, that such wonderful powers were possessed by poisoners. John, King of Castile, was said to have been poisoned by a pair of boots prepared by a Turk ; Henry IV. by gloves ; Louis XIV., fearing a project to poison Philip V. of Spain, prohibited his opening letters or putting on gloves ; Pope Clement VII. is said to have been poisoned by a taper ; and, as a climax of absurdity, a priest is reported to have offered to destroy Queen Elizabeth by poisoning her saddle (Sir Edward Coke, in the trial of Sir John Hollis). Still, I do not think that we have any reason to believe that such wonderful knowledge of poisons was possessed in those days. The acquaintance of these poisoners with chemistry must have been remarkable if they could have so far exceeded anything known in these days ; and there was *no* science of chemistry then. The alchemists worked entirely at random ; they had no knowledge of the true nature of chemical compounds, or even of simple bodies. To

them the metals were not elementary, but compounds, which a slight change might convert into gold or silver, if only the means to bring about that change could be discovered. They knew that certain plants possessed poisonous properties, but they did not know how to isolate the poisonous principles; they distilled liquids in the hope of obtaining these, and merely destroyed them in the process. They had no means of obtaining pure materials to work with, for they had no way of ascertaining their purity when analysis was unknown, and every repetition of an operation was uncertain when it was a mere matter of chance whether the materials employed were the same. Our knowledge of minerals is far greater than theirs; instead of seven or eight metals, we know fifty; our knowledge of botany is far more extended than theirs; we can not only ascertain the poisonous nature of plants, like them, by experiment, but isolate the deadly alkaloid. We do not run the risk of neutralising the action of one body by another incompatible with it, or of destroying a compound by treatment which decomposes it; and if in these days we do not try experiments on human beings, a Vivisection Act shows that our physiologists have no particular compunction with regard to animals. Yet we cannot produce any of these wonderful effects; and, in the absence of indubitable proofs, we may fairly doubt the alleged facts. What were the poisons employed then? The aqua tofana was most probably, from the description of its effects, stripped of romantic details, a solution of arsenic in some alkaline liquid; the powder of succession is said to have been sugar of lead; and prussic acid, in a dilute form, was certainly known, obtained by the distillation of laurel leaves, or from bitter almonds. The true source of the success of these poisoners was the ignorance of chemistry which prevailed, not the knowledge of it; it was the impossibility of detecting the poison in the body of the victim, not the incredible subtlety of its nature;

and, with the discovery of analytical chemistry, with its power of detecting almost imponderable amounts of mineral bodies at least, secret and slow poisoning have passed away into the same limbo as the philosopher's stone, the elixir of life, and the universal alcahest. "Omne ignotum pro mirifico" is true with regard to this as well as other fabled powers of the ancients. To all this it may be added that the use of such volatile poisons as some of those spoken of, would have been as dangerous to the maker and user as to the intended victim ; and one cannot repress a smile when we read of the glass mask, which is one of the stock properties of the novelists' poisoner, when we try to imagine how that could prevent the poisonous vapour from finding its way into the lungs of the poisoner, mixed with the air which must have been furnished in some manner to prevent him from dying of suffocation.

3.—That slow poisoning is possible, i.e., that a poison can be administered so as to produce its effects only after the lapse of days, and then to kill. I give this definition to distinguish this form of slow poisoning from that which certainly is possible, that resulting from the successive administration of small doses of a poisonous substance. That the former was believed in, even by scientific men, two hundred years ago, is evident from a list of questions drawn up by the Royal Society shortly after its institution, to be used by travellers in India and China, one of which was : "Whether the Indians can so prepare that stupefying herb, datura, that they make it be several days, months, or years, according as they will have it, in a man's body, without doing him any hurt, and, at the end, kill, without missing half-an-hour's time." Some romancing traveller must have set this notion afloat, and it is just as much to be believed as the tales of Italian poisoners.

In opposition to all these fables, I quote Dr. Taylor, who

states that in general all poisons manifest their effects in not more than two hours. Under certain circumstances, partly depending on the form in which the poison is administered, as, for example, arsenic in coarse powder, or the state of the stomach, as being full, as long as ten hours may elapse ; but this, he thinks, is the maximum time. The only instances which I have met with at all resembling slow poisoning are two, in which two assistants of Dr. Odling, who had been engaged in experimenting on a new organic metallic body, mercuric methide, were the sufferers. One had worked with it for three months, painful symptoms of mercurial poisoning showed themselves, and in eleven days from admission to the hospital he died, becoming maniacal before death. The other had only worked with the substance for a fortnight in January ; in March, 1865, he was admitted to the hospital, became gradually worse, and in July was idiotic, recognised no one, was deaf, and unable to speak any words. He remained in the same state until April 7, 1866, and then died.

Nitro-benzole, in experiments on animals, has been found occasionally to act after three or four days have passed without sign of injury, death resulting sometimes in nine days after administration. The known cases in human beings were characterised by speedy action, and fatal results in a short time.

In some cases where serious local injury has been caused by powerful corrosive bodies, as strong acids and alkalies, death sometimes results, after a considerable time, in consequence of what we may call the mechanical effects ; but these bodies are scarcely what we understand in a general way by poisons.

4.—That there is a chemical means of distinguishing between poisonous and non-poisonous bodies taken generally. This fallacy is the one which has particularly come under

my notice. Persons continually bring me animals, articles of food, medicine, &c., to analyse, and when their curiosity to know whether they or their animals are being poisoned is considerably diminished by the number of guineas asked for the detection of the poison, they regularly say, "Well, can you not say whether there is something poisonous, without specifying exactly what it is?" And when I assure them that chemistry knows no test to distinguish poisonous properties, they go away with, I fear, the firm conviction that the chemist of to-day is a humbug, in no way to be compared with his ancient ancestor in the business. Yet, if we consider that poisons may be metallic or non-metallic; acid, alkaline, or neutral; mineral, vegetable, or animal; elementary or compound; that in many cases the body may be a poison or wholesome, according to the quantity taken, as common salt or nitre, it will, I hope, be plain that no test can infallibly detect this poisonous property, and tests for poisons generally do not exist; and that, when no indications are given, the only plan is to look for every known poison individually. To this fallacy is naturally related the next.

5.—That poisons are of easy detection. Here I must enter a strong protest against the novelist. In novels the doctor usually, with the aid of chemicals, sometimes drawn from the kitchen, or, at all events, contained in a small laboratory which he carries about with him, forthwith pronounces the name of the poison contained in the draught.

I will give two instances from *Monte Christo*. I translate from the original. The poison used is supposed to be brucine, from its bitter taste, and, I suppose, the effects produced; it was given in lemonade. M. d'Avrigny speaks of having sent into the kitchen for some syrup of violets, which he has put into a glass. "The doctor poured slowly some drops of lemonade from the carafe into the cup, and immediately a cloud was seen to form at the bottom of the

cup ; this cloud took at first a blue shade, then from sapphire it passed to opal, and from opal to emerald.

"Arrived at this colour, it fixed itself so to say ; the experiment left no doubt.

"'The unhappy Barrois has been poisoned with false Angostura bark, or St. Ignatius' bean,' said d'Avrigny ; 'now I will answer for it before men and before God.'"

And, if he could have got the result so pictorially described, it might have been due to carbonate of soda, only he could not. Lemonade is an acid drink in France as in England, and the reaction by which syrup of violets becomes green is common to all bodies with an alkaline reaction. Brucine, being an alkaloid, would give the reaction if it were free, but in an acid liquid nothing would happen.

Then, when the poison was changed for a narcotic not named, but clearly morphia is meant, we read, "Then he ran to one of the cupboards in Valentine's room, a cupboard transformed into a druggist's store, and drawing from its little silver case a bottle of nitric acid, he let a few drops fall into the opal liquor, which was changed at once into half-a-glass of vermillion blood-red (*sang vermeil*)."

Here it is erroneously supposed that because strong nitric acid upon dry morphia will produce a red colour, it would do the same in a solution in which the morphia was in a highly diluted state, and in which, as it was a beverage prepared by the doctor, we may assume that other organic substances were present, whereas no result at all would follow.

The truth is, that in almost all cases, and especially in those in which organic poisons are used, the poisonous substance must be isolated from all other bodies with which it has been mixed, and obtained in a pure state before the tests which characterise it can be applied. This, in many cases, is a tedious and difficult operation, requiring the appliances of a laboratory and the skill of a practised toxicologist. That these

remarks are not unnecessary, is proved by a case of which I read in the *Times* a short time since. The case was evidently one of opium poisoning, but, unless the case was incorrectly reported, the doctor who tested for the poison did so in the contents of the stomach without any preparation. If so, I have no hesitation in saying that the tests were valueless.

6.—That chemists can in all cases detect the poison which has been employed.

This is true when mineral poisons have been employed, although phosphorus must be looked for before it has become oxidised, and prussic acid, in small doses, in a few days is lost by volatilisation. But when we come to organic poisons, the number of those which admit of certain chemical detection in the body, when death has been caused by doses not much larger than sufficient to produce death, is very small. Strychnine is fortunately one of these; but this body is exceptional among organic bodies. It appears to be little effected by the fluids of the body; it even withstands the action of strong sulphuric acid, assisted by heat, and its reactions are numerous and delicate. This is not the case with many other alkaloids. They are generally complex bodies given to decompose; it is probable that many of them undergo molecular change in producing their deadly effect; and, to take a particular instance, morphia is one of the most frequently employed organic poisons, and yet I think there is satisfactory evidence that when employed in small quantities it is hopeless to look for chemical evidence of its presence.

The tests for alkaloids are for the most part colour tests, under the action of concentrated acids and powerful chemical agents, and the removal of all extraneous organic matter is most difficult to effect, and is yet absolutely necessary. Then, for some of these bodies, I think I shall be unchallenged when I say that there are no tests known on which a con-

scientious chemist would risk the life of a fellow-creature, and his own reputation.

Another danger in regard to the detection of alkaloidal poisons has recently been pointed out by Moriggia and Battistini (abstract in *Journal of Chemical Society*), who have shown that, in putrefying animal matter, alkaloids are formed similar in physiological effect to atropine, and as poisonous.

F. Selmi, from experiments made on the putrefied viscera of an animal poisoned by atropine, and on the alkaloids generated by the putrefactive process in the viscera themselves, finds that one of those formed in the latter case, and which may be extracted by the use of analytic alcohol, closely resembles atropine in its action on the animal organism.

Some experiments, made by Dr. F. C. Calvert, also showed the formation of alkaloids in decomposed meat.

7.—That some poisons have the effect of producing external marks on the body, such as blotches or spots. Tacitus says that the body of Britannicus became black from the effect of poison administered by Nero. The symptoms of death were that he was seized with an epileptic fit, and died suddenly. Captain Donellan was accused, in 1791, of poisoning Sir Theodosius Boughton, his wife's brother. Among other evidence, it was stated that when the body was disinterred, it was of the colour of a pickled walnut. In both these cases, death was immediate, and in the latter, laurel water was said to be the cause of death. I do not find, in looking over Taylor's *Medical Jurisprudence*, and other toxicological works, that any known poison manifests itself in this way, and although there is evidence that prussic acid will produce occasionally lividity of the countenance, owing to congestion, this is not always the case: Taylor says, "The post-mortem appearances are very slight," and in another place, speaking of the body of a person poisoned with a small

dose, "it had very much the appearance of the body of a person who had died from asphyxia." Speaking generally, he says, "From this general summary of the appearances, it will be perceived that there is but little to be derived from an inspection of the body at all characteristic of the cause of death."

The description of the effect of hemlock (?), in *Hamlet*, is well known :—

"Sleeping within my orchard,  
My custom always of the afternoon,  
Upon my secure hour thy uncle stole,  
With juice of cursed hebenon in a vial,  
And in the porches of mine ears did pour  
The leperous distilment ; whose effect  
Holds such an enmity with blood of man,  
That, swift as quicksilver, it courses through  
The natural gates and alleys of the body ;  
And, with a sudden vigour, it doth posset  
And curd, like eager droppings into milk,  
The thin and wholesome blood : so did it mine;  
And a most instant tetter bark'd about,  
Most lazarus-like, with vile and loathsome crust,  
All my smooth body."      Act I., Scene 5.

In all cases where such results follow, I think, in these days, there would not be much doubt that disease, not poison, was the cause of death. In how many cases in history, where this was considered evidence, the innocent have suffered, or their characters have been branded with the accusation of this fearful crime, will never be known, but all students will recall many cases.

8.—"That narcotic poisons are known which, in carefully arranged dose, will cause suspension of the vital functions, so as to deceive even a medical man into a belief that death has occurred, and that, after a certain time, the person will revive without injury."

Abundance of instances of this belief may be met with in popular literature. In *Romeo and Juliet* :—

“Take thou this phial, being then in bed,  
And this distilled liquor drink thou off,  
When, presently, through all thy veins shall run  
A cold and drowsy humour, which shall seize  
Each vital spirit ; for no pulse shall keep  
Its natural progress, but surcease to beat ;  
No warmth, no breath, shall testify thou liv'st ;  
The roses in thy lips and cheeks shall fade  
To paly ashes ; thy eyes' windows fall,  
Like death, when he shuts up the day of life ;  
Each part, deprived of supple government,  
Shall, stiff and stark and cold, appear like death :  
And in this borrow'd likeness of shrunk death  
Thou shalt remain full two and forty hours,  
And then awake as from a pleasant sleep.” Act iv., Scene 1.

Miss Braddon, in the book before quoted from : “The potion given her by Blurosset was a very powerful opiate, which had produced a sleep resembling death in all its outward symptoms.”

Dumas, in *Monte Christo*, after the count has given Valentine a pill, of the size of a pea, of haschisch, describes the effect produced : “The young girl no longer breathed, her teeth, half separated, did not let any atom of that breath escape which reveals life ; her whitening lips had ceased to quiver ; her eyes bathed in a violet vapour, which seemed to have filtered under the skin ; and her long lashes streaked a skin already dull as wax.” “Her heart was silent and frozen.”

This was supposed to last more than thirty-six hours, as the narcotic was taken at midnight ; the body remained all the next day, and was taken to Père-la-Chaise at twelve o'clock the day after. No details are given of the return

to consciousness, but that no ill effects followed we gather from subsequent events.

Now, that nothing of all this is possible I think we may rest assured. For life to continue without oxidation or movement of the blood is inconceivable, without a miracle.

The stoppage of the heart's action is one of the surest signs of death. A French commission, including MM. Duneril, Magendie, Andral, Serres, and Rayer, awarded the Manni Prize to M. Bouchut, for researches showing that in cases of apparent death from asphyxia or syncope there was one distinguishing symptom, the continuance of the pulsation of the heart.

I have not been able to meet in my reading with any narcotic which would produce anything like the effects mentioned. If narcotics are given in large doses, stertorous breathing appears to be one of the general symptoms, when the narcotism is so complete that the patient cannot be aroused.

I have thus brought before you the present state of our knowledge with regard to these popular errors about poisons. I do not think that it is amiss fairly and fully to confess our ignorance of many points in the detection of poisons, as I do not fear that any practical injury can result from such candour. The poisons which the chemist cannot detect are those which none but the scientific chemist can procure, and their physiological effects are sufficiently well marked to leave little doubt with regard to their use.

I have, therefore, endeavoured to elicit the truth irrespective of consequences, and in this I think I best fulfil the aim and interests of this Society.

## ON THE SUFFIX -STER.

By JOSEPH BOULT.

In an instructive communication to this Society last Session, on *Repetition and Reduplication in Language*, Mr. Newby Hetherington observes that, in Old English, -ster "was a common ending to mark the feminine, and we still retain it with part of its old force in *spinster*. Up to the end of the thirteenth century, -ster was a characteristic sign of the feminine gender, and by its means new feminines could always be formed from the masculine, e.g., *baccestre*, *hearpestre*, and a very curious form, *belleringestre*. In the fourteenth century, we find the suffix -ster giving place to the Norman-French -ess, and there is consequently a want of uniformity in the employment of this termination. Robert of Brunne, 1325, uses *sangster* as masculine; and eventually -ster came to denote the agent or doer of an action, though a good number of nouns with this suffix are to be found as feminines late in the fifteenth century. Now when -ster was losing its original power, the meaning of the word was emphasised by adding the Romance suffix -ess, and such new words were formed as *songstress* and *seamstress*, which are etymologically double feminines."\*

If Mr. Hetherington errs in these observations, it is in good company, and he may justify himself by many venerable precedents; nevertheless, there appear to me grounds for assuming that he and those who concur in the views expressed do err; and I will submit to your judgment the base of my opinions.

\* *Proceedings Literary and Philosophical Society*, No. xxx. 1875-6, p. 182.

First, for some authorities anterior to the end of the thirteenth century. In an Anglo-Saxon *Vocabulary*, ascribed to the eleventh century, *baecestre* is the gloss for *pistor*; and in a semi-Saxon *Vocabulary* of the twelfth century is the same gloss, varied in the spelling, *bakestre*. John de Garlande, in the first half of the thirteenth century, has a similar gloss, spelt *baxtres*.\*

It would appear, then, that so far as bakers were concerned the suffix -ster had no exclusively feminine application as early as the eleventh century.

An English *Vocabulary* of the fifteenth century has *hæc brasistræ* brewster, and *hic pistor bacster*; a *Nominales* of the same period gives the word webster as common to both sexes, *hic textor* and *hec textrix*; and enumerates among feminine occupations those of kempster, sewster, barbor, baxter, brewster, hukster, and brawdster, or embroiderer. In the same *Nominales*, *hec citharista* is glossed harper; whilst in the supplement to Alfric's *Vocabulary*, tenth or eleventh century, it is rendered hearpestre, *citharedus* being harper.

In *Prompt Parv.*, 1440, there is not any exclusive application of the suffix -ster to feminines.

I am unable to find more than such partial applications as those referred to; and I doubt if they were more than temporary or local, just as the several functions were discharged by either sex. A simple citation of the words having that suffix will, I think, be accepted as throwing grave doubt upon the statement that it had ever an exclusively feminine significance. From the following list are excluded, not only such words as aster, sister, and jester, but words like alabaster and balluster; derivatives from Greek or Latin; and also such local and personal names as Collister, Hobbi-

\* *A Volume of Vocabularies*, edited by Thomas Wright, M.A., &c., 1857. Privately printed at the expense of Joseph Mayer, Esq., F.S.A.

ster, Isbister, Lydster, Ulster, and Inkster; the number of exceptions indicating a want of precision in the canon adopted by Mr. Hetherington, in itself discrediting.

*Aistre* .....A house ; a fire-place ; a street ; a circumstance.

"it was not left,  
Tyl I hadde alle the gardyn bene,  
In the estres which men might sene."

*The Romaunt of the Rose.*

*Alchemister* .....An alchemist.

*Arcister* .....Arcista ; dioleticus.

*Backsters* .....Flat boards strapped to the feet for walking over a loose beach.

*Bagster* .....? A bag or breeches maker.

*Bandster* .....One who binds sheaves after reapers.

*Bangister* .....} Swipes ; strength of hand ; also to cheat.  
*Bangster* .....}

*Banister* .....A bath-keeper.

*Bannister* .....A person paid to remove to another jurisdiction.

*Barrister* .....A pleader in law.

*Baster* .....A heavy blow.

*Baxter* .....A baker.

*Bellingestere* .....A bellringer.

*Bleykester* .....A bleacher.

*Boister* .....A rough fellow.

*Bolster* .....A headrest.

*Brewster* .....A brewer.

*Broadster* .....An embroiderer.

*Canister* .....A metallic vessel.

*Chidester* .....A scold.

*Chorister* .....A member of a choir.

- Costermonger* .....A dealer in vegetables.  
*Dabster* .....An expert.  
*Deemster* .....An arbitrator or assessor.  
*Dexter* .....? *Digester*, or *dykester*; a ditcher.  
*\*Drugster* .....A druggist.  
*Dryster* .....A dryer (*siccatrix*).  
*Dybynister* .....A theologian.  
*Faldistor* .....The highest seat of a bishop, enclosed  
with a lattice.  
*Fewster* .....A feuar or feoffee.  
*Foister* .....A pickpocket.  
*Fopster* .....A cutpurse.  
*Fruitstere* .....A fruit dealer.  
*Gamester* .....A gambler.  
*Ganister* .....Beds in the coal measures.  
*Gunster* .....One who shoots with a gun.  
*Hackster* .....A butcher, a cut-throat.  
*Halster* .....A swaggerer, a ruffian; one who draws a  
barge.  
*Harpestre* .....A harper.  
*Hobbester* .....A dancer; a kind of fish. ? A lobster.  
*Hoggastere* ..... } A boar of three years.  
*Hogsteer* ..... }  
*Holster* .....A case for horse pistols.  
*Hoppestre* .....A dancer.  
*Huckster* .....A petty dealer; *caupones*, *victillarius*,  
auctionatrix.  
*Huester* .....A dyer.  
*Jouster* .....A retailer of fish.  
*Kempster* .....A comber.  
*Land-metster* .....A measurer of land.  
*Laster* .....The flowing tide.  
*Legester* .....A lawyer.

\* *Druggeria*, a place of drugs, or drugsters' shops, &c.

- Leister* ..... A salmon spear.  
*Likestre* ..... A laundress; *linctrix*.  
*Lister* ..... One who reads some part of the church service.  
*Libster* ..... A dyer.  
*Lobster* ..... } A crustacean; a stoat.  
*Loppestre* ..... } A young sole.  
*Maltster* ..... A maker of malt.  
*Minster* ..... A monastery.  
*Oldster* ..... A senior.  
*Organister* ..... An organist.  
*Oyster* ..... A mollusc.  
*Palmister* ..... A diviner from the hand-palm.  
*Palster* ..... A pilgrim's staff.  
*Plaister* ..... A surface application.  
*Plumstere* ..... A plumber.  
*Poetaster* ..... A versifier.  
*Prester* ..... A priest.  
*Prigster* ..... A thief.  
*Punster* ..... A player on words.  
*Radchenistre* ..... ? An arbitrator.  
*Register* ..... A record.  
*Rhymester* ..... A maker of rhymes.  
*Roadster* ..... A traveller's horse.  
*Roister* ..... A riotous person.  
*Royster* ..... An inventory.  
*Salester* ..... A saltmaker.  
*Sawistar* ..... A sawyer.  
*Seamster* ..... }  
*Shepster* ..... } A stitcher.  
*Shooster* ..... }  
*Segster* ..... A sexton.  
*Seister (shêter)* ... A javelin-thrower; *jaculator*.  
*Shepster* ..... A sheep-shearer.

\**Shipster* ..... A sailor or shipwright.

*Songster* ..... A vocalist.

*Spinster* ..... An unmarried female.

*Tapster* ..... An ale-drawer.

Falstaff says:—"A tapster is a good trade ; an old cloak makes a new jerkin ; a withered serving-man a fresh tapster."

*Teamster* ..... A carter or waggoner.

*Thaxter* ..... A thatcher.

*Throwster* ..... A silk-weaver.

*Tilstere* ..... A magician.

*Trickster* ..... A slippery fellow.

*Tumbestere* ..... ? A dancer.

*Tymbesterre* ..... A juggler with a *timbre* ; a metal basin.

"The tymbres up ful sotilly  
They caste, and hente fulle ofte  
Upon a finger fair and softe,  
That they failide never mo."

—*The Romaunt of the Rose*.

*Upholdere* ..... A dealer in smallwares.

(? *Upholster*)

*Note*.—*Upholstar* is glossed by Palsgrave *frippier* ; i.e., a dealer in old clothes.

*Wafestere* ..... A maker of wafers ; the unleavened cakes of the Eucharist.

*Waschestre* ..... A laundress—*lotrix*.

*Webster* ..... A weaver ; a knitter.

*Whipster* ..... A youth ; a bleacher.

*Woolster* ..... A woolstapler.

? A woolwright, i.e., a woollen-weaver.

*Wooster* ..... A suitor, a wooer.

\* *Shipster* is A.-S. *scip-styra*, a ship steerer or pilot.—Lower's *English Surnames*. To me the word appears to be K. *scib-eistear*, or primarily *sgiob-eistear*; unless it is allied to *shepster*, a sewer; in which case both words may denote a sailmaker.

*Whyster* . . . . . A bleacher.

*Ydolaster* . . . . . An idolater.

*Youngster* . . . . . A junior.

To the above may be added *smere-mangestere*, which occurs in the *Domes* of Æthelred, *De Inst Lund*, and is glossed by Thorpe, "A woman who deals in butter." The passage in which it occurs relates to the toll-giving at Billingsgate, and is as follows:—"Smeremangestre, que mangonant in caseo et butiro xiv. diebus ante Natale Domini unum dñ, et septem diebus post Natale unum alium." That is, smeremangesters who deal in butter and cheese are to pay the tolls mentioned; but other smeremangesters who did not deal in those two commodities were exempt, such as dealers in oil, tallow, grease; from K. *smear*, grease, tallow; monger is manifestly K. *mangaire*, a dealer, a peddler, a jobber—G. *sailmhangaire*. There are also several synonyms for a bleacher in *Prompt Parv.*, namely, bleyster, plekstare, qwystante, and whyster; probably the last two should be qwystante and whytster; and that all denote bleachers.

Some of the words quoted above have, no doubt, fallen into disuse, whilst others are comparatively modern. The Poet Laureate has recently formed a word on the like model, in his tragedy of *Harold*, where the hero says:—

"The simple, silent, selfless man  
Is worth a world of *tonguesters*."

Shakespere possibly exercised a similar license when, in the *Merry Wives of Windsor*, he wrote:—

"Against such lewdsters, and their lechery,  
Those that betray them do no treachery;"

and it may be inferred that some other words have a like origin.

Reverting to the list of words, it is clear that many of them could never have had a feminine signification, though unquestionably of ancient date.

The meaning of the word radchenistre is uncertain, but no one ever suggested it was feminine; ladies, ere long, may be called to the bar, but hitherto none have been called barristers, though *Portia* and Lady William Russell are illustrious exceptions to usage.

Chorister, originally, would doubtless be masculine, considering how jealous the Papal Church has ever been of the intrusion of females into the choir.

The ruffianly bangster and hackster, and the useful sawistar, are essentially unfeminine; while the ringing of church bells, and the office of sexton, would scarcely be permitted to women. Other words were, no doubt, employed indifferently, as baxter, brewster, huckster, kempster, and seamster; whilst others may be regarded as neuter, like canister, bolster, holster, lobster, oyster, and roadster. Thus it would appear that to define *-estre* or *-istre* as the feminine termination of nouns of action, same as the Latin *-ix* and English *-ess*, to quote the definition of Bosworth, is very fallacious; and that definition is no doubt due to the remarkable supposition that modern English speech is essentially Teutonic; the favourite hypothesis of those whom one of the most eminent living philologists dubs saxo-maniacs.

So far as my inquiry has proceeded, it appears to me almost indisputable that the English are essentially Keltic, in name, race, and language, and that the continuity of English history dates from a period earlier than the incursions of Julius Cæsar. That Keltic essence has doubtless been greatly modified by continuous immigration from the continent, which, as we have evidence, preceded Cæsar, and has not ceased even to this day; whilst

those who represent the indigenous people, still continue that westward march which seems inherent in the race.

If the suffix -ster be not derived from that stage of development of our mother-tongue aptly termed Anglo-Sacsan, perhaps the root may be found in an earlier growth. It appears to me that it, and some of the earliest words to which it is added, are Keltic, and are derived from the speech of those who abided in Britain when the Romans withdrew, and still live in the English-speaking races of the present day. The Irish word *eistear*, signifies an art, a trade; and this meaning is implied in the suffix -ster. A barrister follows the art or pursuit of the bar; the baxter, that of baking; the brewster, of brewing; the webster, of weaving; and so of the rest of the list. It is true the suffix is not found in modern Irish, in which the place is usually supplied by -aire, or some other equivalent for the modern English -er, and the Latin -or. Although the crude forms of baker, brewer, webster, and other words are to be found in Irish, the words most generally used appear to be of wholly different character; a change doubtless due to the incidents of the long interval of time since that branch of the race separated from those who remained in England, and submitted to the logic of circumstances.

In Irish are words *bacailine*, I bake; *bacail*, baking; *bacalta*, baked; and *bacala*, a bakehouse; adding the suffix to the root of those words produces *bac-easter*, the baking art; the change thence to baxter may be traced orthographically almost letter for letter. The application of the name of the art to the person who practises the art is probably due to some misconception on the part of foreign immigrants, similar to that which originated the mistake as to -ster or -estre being feminine.

The root of the word to brew means both to boil and to bake; *bruith* denotes flesh, broth, boiling, smelting, and

baking ; and the verbs, adjectives, and nouns derived from it are equally varied ; whilst the noun *bruin* is a large pot, or brewing-pan, and *bruitheoir*, a brewer. Of the original variety in the signification of the root are survivals in broth, brew, and brewis, the last a word still in use in Lancashire and Yorkshire, glossed oatcake or bread, toasted, and soaked in broth or stew. Mr. Gaskell is quoted, as explaining that, in Lancashire, bread soaked in broth, or in the fat that drips from meat when being roasted, is known as *brewis*. A writer in the reign of Edward VI. refers to “*brewess* made with bread and fat meat.”—*Lect. Lanc. Dialect.*\* So far, however, from *brewis* being peculiar to Lancashire, it appears in Pardon’s edition of Dyche’s *Dictionary*, 1785, as *brewess* or *brewiss*, biscuits, or crusts of bread, soaked in the liquor and fat of boiling meat ; and *broth* is described as the liquor in which flesh or pulse is boiled.

In Scotland, the epithet *browster-wife* is applied to female ale-sellers, especially in markets, plainly showing that *browster* alone may be masculine.

The word *webster*, in its different orthography, has reference to the processes of knitting and weaving, implying that the latter is a development of the former. The verbal root is doubtless K. *fíghim*, I weave, plait, twist ; from the present participle of which, weaving, is obtained *fíghad*, pronounced weeoo, to which annexing *fear* (Lat. *vir*), a man, is formed the modern English word *weaver*, literally weaving-man, in which the suppressed *a* is a survival from the original form. The Irish for weaver is *figheadoir*. When the name of the artisan became weaver, another series of words would be formed, as the verb to weave, weaving, weft ; the latter the crisp sound of weaved, like left for leaved, past for

\* *A Glossary of the Lancashire Dialect*, by John H. Nodal and George Milner. Part I. Publications of the Manchester Literary Club. It is to be regretted that the contributors to this valuable work do not carry their etymological inquiry beyond the Anglo-Saxon period.

passed, and wolf for wolve. Dropping the final t in weft, by mutation, the letter 'f' becomes 'b,' forming web; thence webber and webeistear, the first the artisan, the latter the art, the substitution of webster for webber, arising, as suggested, from misconception or metaphorically.

The introduction of the term weaving-man, *i.e.*, weaver, appears to date from the time when knitting-needles were partially superseded by the loom. Previously, no doubt, knitting had usually been woman's work, as it is now; but the application of the loom requiring more physical strength than usually belongs to the gentler sex, the assistance of the male creature was requisite, and the weaving-man became a recognised institution. So with baking and brewing; when they became trades for supplying more than one household, the burden was taken up by men, who thus sought to show their devotion to the weaker vessel. Home-brewed ale and household bread, when genuine, are usually brewed and baked by women, who also retain their pre-eminent position of queen of the teapot, distilling the fragrant cup which cheers, but does not inebriate.

Mr. Lower, in *English Surnames*, glosses whitster as fuller, instead of bleacher, but he has overlooked Mistress Ford's use of the word, when she ordered her men with the buck-basket to "Carry it among the whitsters in Datchet-mead" (*Merry Wives of Windsor*), speaking in whiting time, which appears to fix its meaning as bleacher. Assuming that -ster is feminine, Mr. Lower quotes, with concurrence, Mr. Poulson's explanation in *Beverlac*, of the manner in which those names of feminine employments could become hereditary surnames: "When men began to invade those departments of industry by which women used to earn an honest livelihood, *they retained the feminine appellations for some time*, as men mid-wives and men milliners do now."

Shakespere uses the term woman-tailor. Is it to be supposed that the fair sex, in a body, ever supplanted men in that occupation ?

It would weary your patience to quote glosses of all the words, or to enter into their analysis ; but there are a few which appear to require especial attention ; and they testify how much historic illustration may be drawn from judicious philology.

The word prester for priest, which survives in Prester John's title, is suggestive of the primary function of a priest's office. Assuming that the final syllable represents the suffix -ster, and that K. *eistear*, a trade or calling, whence is the first part of the word derived ? It is possible that the letter i in the word, as now used, may be a survival, and, with this clue, it seems probable that the word was formerly *breith eistear*,\* the prefix in which, *breith*, signifies penance ; thus the whole word would designate the calling or occupation of doing penance. But the proper signification of *breith*, is judge, judgment, doom, a compact ; also a bearing, a bringing forth ; and it was used in combination with the word *aithrighe*, signifying penance and. repentance, to denote a special penance. In colloquial use, it appears *aithrighe* was dropped, and the priest bore a title which, in its full explicitness, denoted the trade of bearing vicarious penance ; thus he was really a bedesman, of superior degree, but of the same order as Edie Ochiltree, the Blue-gown.

The word radchenistre, occurs in *Domesday* ; and, I think, is seldom, if ever, met with elsewhere. It is found only in the counties of Gloucester, Wilts, Hereford, Worcester, and Salop ; and the designation of Radmann is found in the three latter counties, and also in Cheshire. It appears to me probable that the terms are synonymous, or nearly so. I have

\* When sounded as a dissyllable the aspirated t would be suppressed by the following s ; the substitution of p for b is very common.

attempted to show\* that the Radmanni discharged functions something resembling those of the Roman judices; that the office and name are found at this day in Sweden; that they are men possessing a given position in the community, and were, therefore, eligible or liable to be summoned for the performance of specified duties, that is, to assist in the administration of the law; that the word radmann signified one specially appointed to assist in the adjustment of differences, by explaining local usages; and, it appears to me, that radchenistre resembles it in the first two syllables; they representing K. *radh-ceann*; the termination *-istre* being a modification of *eistear*. Now, assuming that those who bore the designations were arbitrators, and remembering how difficult it is for arbitrators to avoid becoming advocates for the parties by whom they are selected, it seems to be not improbable that the judices, radmanni and radchenistri, were that order of functionaries who are now represented by counsel; who, driven from the bench, on which their presence was unwelcome, since they strove for victory rather than law, took refuge at the bar, and became barrasters or barristers, the most eminent among them being admitted within the bar, but below the bench. Thence their passionate appeals or fierce denunciations have been tolerated, even admired, since those who utter them no longer besmirch the purity of the ermine, to which they are still permitted to aspire.

Doubtless someone will protest this suggestion is fallacious, since a barrister who had kept his terms was styled an *utter* barrister, which means an outer barrister, because, though able to plead, he was not yet admitted within the bar. It seems to me that the fallacy is in the supposition that the word *utter* means outer, or is another mode of spelling the same word. *Utter* appears to be allied to *entire*, as in the

\* *Notes on Early Social Grades in England*, p. 26; privately printed, 1876.

phrases "utter absurdity," "uttermost degree," "utterly impracticable;" and, therefore, the utter barrister is one who has satisfied all the preliminaries to holding a brief.

The word *utter* and its compounds presents an example of the very unsatisfactory shifts to which philologists are driven who assume that the Anglo-Saxon is the earliest form of the English language, and neglect the Keltic speech of the indigenous angle or ongle, French *anglais*, K. *angeilleis*. It is difficult to associate the ideas of perfection and exterior; and yet, if *utter* is a form of *outer*, the association must exist in some form. Utmost, which represents S. *utmæst*, *utmest*, is obviously a contraction of *uttermost*; and, signifying as it does, adjectively, extreme, or in the highest degree, and, substantively, the most that can be, the greatest power, appears far removed from mere externality. *Utter* appears to me allied to K. *uachdar*, the top, the summit, W. *uchder*; thence *uachdairach* and *uachdaraighe*, uppermost, highest; and *uachdaran*, a governor, ruler, superior. Correlative with these words are *ughdarash*, authoritative; *ughdarach* and *ughdasas*, authority, dynasty; *ughdurasach* and *ughdargha*, authentic; and the verb *ughdarasaine*, I authorise. The primitive of this series, *ughdar*, is glossed by O'Reilly, author; but, from the derivatives, it would seem also to denote one who gives or possesses authority, and may be accepted as the root of *utter*, as applied to an apprentice who was authorised to practise at the bar. So the person who, in legal phraseology, utters a document or a coin, assumes for it an authority which may or may not be valid; and people who utter their opinions give them authorised expression. The looser applications of the word and its compounds are among the incidents common to all words and phrases.

The weird pursuit of alchemy, after holding the intelligence of the civilised world under its spell for more than a thousand years, passed away, leaving its more robust twin-

sister, chemistry, to enjoy the fruit of their mutual toil. It seems strange that the received etymology of those names, alchemy and chemistry, should be so unsatisfactory as to suggest that their origin is as occult as that of the philosopher's stone itself. The name of chemistry, like the science itself, is, of course, congenital, and allied to the more visionary pursuit—alchemy.

While all glossarists are willing to accept an Arabic origin for the prefix *al-*, the body of the word is a subject of contention, some asserting that it is of Greek origin, signifying juice or melting, or rendering savoury; others, that it is Oriental, and means black; and others, again, that it is the proper name for Egypt, and signifies the science of the Egyptians. Dr. Latham\* concludes his observations by saying: "How far the origin of the word was unknown in Johnson's time may be seen from the extracts. Nor is it absolutely beyond the range of discussion even at the present time; the most that can be said in favour of its derivation from the native name of Egypt being that the early history of the science favours it."

Under these circumstances it may be allowable to offer further suggestions. One of the earliest alchemists whose works are extant, is Geber, an Arabian physician, who lived in the seventh century; but some doubt has been cast on the genuineness of the works ascribed to him. Assuming that he was the author, it would appear that the pursuit of the philosopher's stone must have engrossed attention for a long period preceding his labours; he is said to have described and depicted various furnaces, crucibles, alembics, and other useful chemical apparatus, of which it is suggested he was probably the inventor; and he treats of distillation, sublimation, calcination, and various other chemical operations.†

\* Dict. in verb. *chemistry*.

† *Penny Cyclopedia*, Art. Alchemy.

Though the tradition which associates alchemy with Trismegistus is as unworthy of acceptance as the etymology which derives the name of alchemy from the native name of Egypt, still, such ideas seem indicative of great antiquity, and imply that the subject was studied long before Geber and the seventh century. It is not impossible, then, that it was known to the Romans, and may have been introduced into these islands during the Roman sway.

I have already suggested that during the period which succeeded the departure of that people, when the whole Continent was convulsed, Britain, like Arabia, was a home for intellectual cultivation, a shrine for the relics of a glorious civilisation.\* Certain it is, that when Charlemagne, in the ninth century, desired to advance the mental culture of his people, he sought help among the Angles of Northumbria. Pretty strong evidence that Britain had not relapsed into barbarism, whatever bitter ecclesiastical partisans may have said. So firmly attached were the Britanni, and especially the Angles, to the gifts bestowed and left by the Romans, that the repeated irruptions of the less civilised Sacsans, and the uncivilised Danes and Norse, were unable wholly to destroy the fruits, however successful they might be in marring their perfect growth.

Among the intellectual treasures which survived the departure of the Romans, and the incursions of barbarians, it seems not improbable that alchemy and chemistry would remain, receiving a vernacular designation, which might abide with them through several of the countries to which they were restored from Britain.

The word alchemister is used by Chaucer, in his *Canon Yeoman's Tale*; and, as before suggested, the termination -ister is probably Keltic. That being assumed, it is reasonable to suppose that the remainder of the word is also Keltic.

\* *Pre-Roman Civilisation in Britain.*

Doubtless, many hybrid words are to be found, but they are exceptional, and always suspicious; and the combination of the Arabic *al*, the, with the ancient name of Egypt, *Cham*, or with the Byzantine Greek words  $\chi\eta\mu\sigma\alpha$  or  $\chi\psi\mu\sigma$ , appears highly questionable. But the Irish furnishes roots for both the principal syllables; and they appear to harmonise perfectly with the little which is known of the history of alchemy and chemistry. In K. *al*, a stone, and *caomha*, skill, knowledge, is that pithy definition in which the Keltic speech excels; the compound indicating that search for the philosopher's stone which taxed the knowledge and resources of the most skilful adepts; whilst those who, mayhap, despised that visionary pursuit, by dropping the first syllable, retained testimony to their honourable and skilful search for knowledge. The pronunciation of *caomha* presents an apparent difficulty, but that, I think, would vanish through coalescence with the suffix *-ister*, or, more correctly, *-eistear*. As the suffix *-ist* is found not only as a contraction of *-ister*, as in organist for organister, harpist for harpestre, and also in words from the Greek, as in sophist, the same termination in alchemist and chemist left the apparent origin of those words very inconsistent and very doubtful. The Welsh for chemist, *fferyll*, also denotes a metallurgist; and another form of the word, *fferyllt*, signifies a metallist, an artizan; whilst the Gaelic, *seorsa tealsanach a bhitas ag obair le teine*, describes a sort of philosopher who works with fire. These designations seem to point to a period when chemistry was metallurgy, and had not advanced beyond the discovery of fluxes, and the assaying of metals; operations of the first importance in Britain, whose chief wealth has ever been metallic, and whose very name indicates her productiveness in tin. Thus, then, additional probability is given to the derivation assigned to the word alchemist, save that its original meaning may have been the practice of rock-science,

rather than merely that of stone-science, for the prefix *al-* may be interpreted either rock or stone. The word *alcamyne*, glossed by Wright\* as a mixed metal, an alchymical term, is not inconsistent with these suggestions. In passing, notice may be given to the word metal, as an example of the epithet given in contempt becoming a title of honour. Of course the word is to be found in Latin, and therefore it is possible that the English have derived it thence; but how did the Romans acquire the word? It seems to me that philologists, and especially lexicographers, are too prone to adopt the first analogue as the origin of the English form of the word, overlooking the fact that the most influential European languages are more or less Keltic, except the German, if that be an exception. Now, the aim, as it appears to me, should be to reduce all forms of a word to its simplest, that is, the crude form, and thence the primary signification would be obtainable; and in its various transformations would be found the history of the word, and, *pro tanto*, the history of the race. The crude form of metal, or *metallum*, appears to me to be in K. *miotaille*, compounded of *miodh*, a diminishing or negative participle, and *ail*, a stone or rock; and signifying the worthless stone, or stone of little value. This meaning survives in the metal used for road-making, which usually consists of stone unfit for any other purpose; and until the art of smelting was discovered, the rock containing metal, the ore, was very unmanageable. So of the Latin *metallum*, which was applied not only to all kinds of ore, but also to marble, stone, and sand; in the present day, and for ages past, it has been specially applied to the most valuable products which can be extracted from rock or earth; and, metaphorically, to men and horses of spirit.

With the word chemist is habitually associated that of

\* *Dict. Obs. and Pro. English*, in verb.

druggist; but I apprehend that the popular impression of the nature of a druggist's business is much less distinct than it is upon a chemist's. To say that a druggist deals in drugs does not produce more distinctness, for the question then arises, What is a drug? in a literal and not in the figurative sense. In Latham's edition of Johnson, a drug is described as a medicinal simple; in a commercial sense, as spice, such as ginger, cinnamon, etc. But, it seems to me, the two descriptions do not cover the whole range of a druggist's business, wholesale or retail; and that there is really not much difference between the druggist and the drysalter, though the latter is sometimes confused with the dealer in salt provisions. Webster, for example, describes him, from Fordyce, as a dealer in salted or dried meats, pickles, sauces, etc. In Liverpool, I find various firms describe themselves as spice, seed, and rice merchants; drysalters, manufacturers of mustard, chicory, etc., or as paint, colour, and varnish manufacturers; oil and drysaltery merchants; or, again, as drysalters, druggists, oil merchants, and dealers in vulcanised India-rubber and gutta-percha; whilst two others are styled drysalters and oil merchants, and drysalters and dyewood cutters. From all which I infer that druggists and drysalters are birds of a feather, and that their wares consist *de omnibus rebus, et quibusdam aliis*. A humorous broker, well known on the Liverpool Exchange, described Tate and Brady as successors to Sternhold and Hopkins, an old and highly respectable firm in the dry(p)saltery business. I suspect, however, that Theodore Hook came very near the mark, when he represented one of his characters in *Gilbert Gurney* as saying, that from a retail dabbler in driblets he became a merchant, a wholesale trafficker in everything, from a barrel of gunpowder to a pickled herring. In the civic acceptation of the word, a merchant; amongst the vulgar, a drysalter.

Ordinary etymology renders no aid, for the reference is simply to the French *drogue*, for drug; and to Saxon *dri*, *drig*, or *dryg*, for the prefix in drysalter. It has occurred to me that the word drug, and the prefix dry, possibly spring from the same root; one or both forms representing considerable modification. As the mineral salt appears to have but a remote connexion with numerous commodities in which drysalters trade, it did not appear likely to have any connexion with the designation, which, I think, is more probably from K. *solathar*, provision; a drysalter's special function being to provide for a number of traders the means of carrying on their respective operations; pronounced as a dissyllable, *solathar* will approach very nearly to salter. If this supposition be correct, the prefix will be relevant; and, if that be assumed to be K. *di-reic*, which may be rendered great, or, in modern phrase, wholesale dealer, the designation is apt, even with modern usage. In remoter ages, when business was not split up into so many sections, the aptness would be still greater. Turning for a moment from the wholesale provision dealer, is it not probable that the Sau't Market, in Glasgow, sacred to the memory of Baillie Nicol Jarvie, derived its name from the provisions there displayed, rather than from salt? Is there really any market in the world that is, or ever was, exclusively devoted to dealings in salt?

By substituting 'u' for 'ei,' in the second part of *di-reic*, and making the words monosyllabic, they become druc, and thence drug; thus the drugister, drugster, or druggist, was essentially the wholesale dealer; the middle-man between the retail dealers and the shipowner and importer, who, in primitive times, frequently commanded his own vessel.

The word minster is usually termed an abbreviation of monastery, though it is difficult to detect the resemblance without careful examination; and, in that, I am again thrown

upon Keltic roots. K. *man*, pronounced *maun*, signifies a solitary person; *manch*, a monk or friar; its resemblance to W. *mynach* is obvious. Passing other derivations, *manastear*, sometimes *mainisdir*, is a monastery; manifestly monaster represents the first form of the word, the final *y* having been added on false analogy. From *mainisdir*, the transition to minister is apparent, and the formation of the suffix -ster is an obvious consequence of contraction into two syllables.

The crustacean known as the lobster, it is said, usually travels by walking or running on the surface of the water; it also swims; but, when alarmed, it arches its body, and, then relaxing it, moves rapidly backwards, flinging itself into its hole in the rocks, through an aperture barely wide enough to admit its body. This characteristic is expressed in the word of which lobster is a contracted variation. K. *lub-eistear* refers to this habit of arching its body; *lub* signifying a loop, a bow; and its derivatives, bending, winding, and, metaphorically, crafty, cunning, and deceitful.

The application in the eastern counties of the word lobster to the stoat is confirmatory of the etymology suggested; appearing due to its moving by leaps and bounds, as well as running with great speed; it is the only weasel that does leap, and it even turns somersaults.

Young soles are likewise called lobsters in Suffolk; they occasionally leap upwards and forwards, as may sometimes be observed in an aquarium; for that purpose, bending the body. Through the kindness of Mr. Moore, I have seen this action of young soles in the Museum, William Brown Street.

In the word oyster, probably, lurks some natural peculiarity of the mollusc, which, however, I have not been able to clear up satisfactorily. The Irish for oyster, *eisir*, the orthography of which varies, signifies the shield-fish, derived, doubtless, from the panoply of mail in which he is encased; another word, *uisaire*, or *uisire*, is applied both to oysters and

usurers ; probably implying that the latter are as close as oysters, and will never part with their possessions but with life itself.

I have sought for a root which should reconcile the Latin *ostrea* with the French *huître*, the Welsh *wystrysan*, and the English oyster, but cannot hit upon anything more probable than *uis-eistear*, the humble pursuit, referring to its lowly attachment to the ground on which its spat fell, and from which it moves not until captured for the gourmand's maw. Analogous to this is the Irish name for the lark, *uiseog*, the humble bird, referring to its lowly habit of nesting on the ground, in its moist cabinet ; *uiseog-coille* is the woodlark, a member of the same family, who also builds on the ground.

The word upholsterer is sometimes adduced as an instance in which the formative element is repeated ; but it seems to me that in this and other instances the conclusion has been adopted without due consideration. Fisherman is not tautological, but distinctive of the men, who take the fish, from the women, still called in Scotland fisherwives, by whom the fish is sold. Indeed, within the last few months, it transpired in a police case in this neighbourhood, that women visit the sea-shore to take cockles and muscles, so that, in times and places, it is not impossible they may cast a net, or handle a rod. So also there are fisherboys and fishergirls. A fishwoman may be a mermaid, but a fisherwoman is unmistakable.

Nor do I see the double plural said to lurk in brethren ; for the singular form, brother, is apt, not only to revert to its early Keltic form of *brathair*, with the first "a" broad, as in French, but also to the fine vowel-sound of brither, as in Scotland. In his address to the *unco guid*, Burns urges them—

"Then gently scan your brither man,  
Still gentler sister woman ;"

and britheren, contracted to brethren, would be the legitimate plural of the singular noun. The Irish have the diminutive form, *brathairin*, little brother. The word brethren is generally used in a special sense; it is seldom applied to the members of a family. In the authorised version, it is true that the Patriarchs are spoken of as Joseph and his brethren, but that is a somewhat exceptional use of the word, which, in its ordinary application, implies a company, society, or church. If the early use of the word was similar, then the suffix, instead of being a plural termination, is a modification of K. *-an*, which is an intensitive particle, implying that those to whom the word brethren is applied are brothers indeed. *An* also signifies union, unanimity, and, therefore, appropriate for an earnest association for special purposes.

So likewise with children, the suffix may have been applied originally to the childer of one household; then extended to those of the same hamlet or clan; and, ultimately, loosely applied to any aggregate, as at present.

Reverting to *upholsterer*,—and judging from analogy with the word *holster*, now confined to the leathern case in which a horseman carries his pistols, but which, probably, had a wider application formerly,—it seems to me that for ages there must have been something from which hangings were suspended. The word *valance*, by which that piece of furniture is now known, is a somewhat recent introduction from Spain; and it appears to have supplanted the indigenous word so completely, that the latter is lost. But that it was *upholster*, that is, a fixture whose purpose was to hold up, or uphold the hangings, appears to me very likely. The word *upholstar*, however, designating a dealer in old clothes, would discredit a word of similar sound though of different import, and so *valance* was readily accepted; while *upholstar*, as the title of a picker up of old articles, soon passed into oblivion almost as complete.

Granted a fixture called an upholster, and the title upholsterer is fit for the man who supplied and fixed it, and attached the hangings to it.

This suggestion receives some support from a comparison of the word fruiterer, now in use, with fruitestere, to be found in Chaucer. As before explained, the suffix *-ster* represents K. *eistear*, a trade, or calling; fruitestere thence denotes the fruit trade, and fruitesterer would be the appellation given to one who followed that trade. Fruitestere, like other words of the like formation, being contracted into fruiter, the trader would of course be termed a fruiterer; and thus the apparent reduplication proves non-existent.

The word huckster is usually referred to the Latin *augere*, the same root as that of auctioneer; but it seems to me that this is scarcely probable, as the huckster was originally a travelling dealer, like the pedlar, with, what Hood called, his little back shop, and the same as the hawker. The Gaelic for pedlar, *ceannache seachrain*, or stray-ing merchant, aptly designates his usual vocation for centuries; but mention is sometimes made of pedlars' shops, and shops where pedlary can be obtained, which indicate that persons who follow the trade occasionally become stationary, yet retain the appellation. In fact, pedlary, like huckstering, is symbolical of contracted notions, in that metaphorical application of simple words which is noticeable in all languages.

I find hawkers described as those deceitful fellows who went from place to place, buying and selling brass, pewter, and other goods and merchandise, which ought to be uttered in open market; and it is suggested that the appellation seems to grow from these uncertain, wandering-like persons, who, with hawks, seek their game where they can find it. Rejecting this suggestion, as allied to that mythological etymology which has been the bane of true philology, I

conjecture that the root is to be found in some word expressive of their wandering life. This I find in K. *achdra*, an expedition by sea or land; G. *achdran*, an adventurer; and the two forms of hawker and huckster, for hauckster, have their analogy in other words.

I apprehend that mysterious word coster is allied to hawker, huckster, and pedlar; to suppose it a corruption of costard, the name of a kind of apple, seems very far fetched, for it is not likely that any number of persons would make a trade of one kind of apple. In the present day, I think, the word costermonger is seldom used out of London, where it is a local or provincial name for dealers in green-grocery, who carry their wares on barrows from house to house. They are, therefore, a species of pedlar or hawker, and possibly, in early times, dealt in a greater variety of wares, before trades were so much specialised.

I have shown above that the word monger is of Keltic origin; and similarly may be derived *ca(cau)-eistear*; and thus a costermonger is one who deals in a house-trade; that is, he takes his wares to the houses to find customers, instead of waiting for householders to come to his shop. Possibly to this custom we are indebted for the words, in nautical phraseology, coaster, coasting, and coast.

It is pretty clear that the suffix -ster has not an essentially feminine signification; but to one word that meaning is indelibly attached, through the technical sense in which it is now used by the legal profession; I mean the title spinster,

“ O word of fear !  
Unpleasing to the maiden’s ear,”

in which it often sounds amiss. In other words, however, the suffix is applied indifferently to masculine, feminine, and neuter.

The root assigned to the suffix -eistear is resolvable into

two words, *eis* and *tir*, signifying a man's land ; and so takes us back to that remote period when trades were not, and the people of these islands depended upon the plot of ground, a rood or more, which " maintained its man," and the right to which, under Odall tenure, was inalienable. The Gaelic for subsistence, *teachd ann tir aran*, coming into bread land, conveys an analogous idea, especially if I am correct in supposing *teachd* to signify a coming in, or entering, under a legal right.

Another fact that appears to me established, is the essentially Keltic origin of the suffix *-ster*. The A.-S. dialect is unable to give any specific interpretation of the syllable ; in that phraseology it is an arbitrary termination only. In Irish the suffix is found as a living word, full of appropriate meaning, which fits it for the office it has filled for so many centuries, and to which it is still applied in additions to our copious vocabulary. If this be so, then it seems clear that, as has been said before, the English language is essentially Keltic.

Let me not be misunderstood. I am not an unreasonable Keltomaniac, whatever may be implied by the clumsy banter of a writer in the *Saturday Review* ; I do not follow Vallancey and Betham in their speculations, which appear to me very wild ; nor do I agree with Shaw, that Gaelic is the language of Japhet, spoken before the Deluge, and probably the speech of Paradise ; but I do believe it to be the basis of every form of speech which has been current in these islands within the historic period. I have endeavoured, by the careful collection of facts and probabilities, to test that conclusion ; and, hitherto, I have found abundant confirmation in the facts of history ; in legislative enactments ; in manners and customs ; in speech, and in local names ; and I submit such an inquiry is not unworthy of the respectful consideration it has hitherto received from this Society.

## MARQUESAN TRADITION OF THE DELUGE.

By J. LINTON PALMER.

I FOUND among my notes, a few days since, a Tradition Legend of the Deluge, which I met with in a rather out-of-the-way place, the Marquesas Islands. As this legend has so many points in common with the account of the same event as preserved by the Chaldeans and Hebrews, and differs from those of other tribes or nations, I am induced to ask you to let me read it to you, but must preface some short account of the place and its inhabitants, which I hope will not weary you. Every year these legends are getting more difficult to obtain, and, I am told, principally because the natives, on embracing Christianity, are taught to consider them worthless.

## DESCRIPTION.

The Marquesas Islands, eleven in number, form a group in the South Pacific, lat. 10° south, long. 140° west. They were discovered in July, 1595, by Don Alonzo Mendana de Negra, who named the group after the then Viceroy of Peru, Mendoça, Marques de Cañete.

They have been repeatedly visited by navigators of repute, among whom are Cook, 1774; Le Marchand, 1791; Roberts (American), 1797, who stayed for three months at Santa Christina; Wilson, 1797; and Admiral Krusenstern. The best accounts are by the two latter writers. The French took possession of them in April, 1852, by Admiral du Petit Thouars, a fortnight before the coming of the English Squadron, under Sir Fairfax Moresby, to whose flag-ship, the *Portland*, I was attached.

The three principal islands are—

(1) Hiva-oa, or Dominica, the largest and most fertile, about the size of the Isle of Wight.

(2) Nukuhiva, where the French Establishment is, and the scene of the charming novel of Herman Melville, *Typee*.

(3) Fatuhiva, or Magdalena, the southernmost.

They are fine islands, and must, from their internal evidence, have been very populated; but by the importation of small-pox (in the Peruvian coolie-raid, 1864), their numbers were decimated; in consequence of this disease, the natives assert, even the fecundity of the women was diminished. The disease, too, was spread by the reckless ignorance of the natives, who could not understand infection. A man has been seen to take the pipe from the mouth of a semi-moribund, and smoke it.

As a type of the group, let me take Nukuhiva, a bold, rugged volcanic mass, with hills three thousand six hundred feet high, furrowed by deep valleys, full of magnificent trees, palms, breadfruit, chestnut (Mahinei), vee-apple, orange, guava (quite a pest), plantains, and exquisite ferns; plenty of streams, mineral springs, soda-water springs; flowers in abundance, of shrubs, climbers, and orchids.

Animals are very few; imported oxen nearly, if not quite, wild; pigs, quite so. Birds are few in number; domestic fowl, wild, which have forgotten how to crow, but are very good as food. Among insects, splendid butterflies; mosquitoes are very virulent. The centipede is the only noxious one. It grows to a large size here, and is much respected, as it is supposed to be able to bequeath its vengeance. Hence, unless there is a fire near in which to consume it, no native will kill it, or allow it to be killed.

The climate is very agreeable, though rather warm. I see the heat ranged, during our visit, from 74° to 84° Fahrenheit. It is difficult to form an estimate of the

number of the inhabitants now. Fifteen years ago, the whole group was supposed to have twelve thousand.

#### INHABITANTS.

In Nukuhiva, which has about two thousand seven hundred people, the natives are divided into ten tribes, subdivided into families, each quite independent of the other, and governed by a chief, who is responsible for all its doings. The option of peace or war is vested in him. The land of a tribe, usually a valley, is held in his name. To each individual is allotted a portion, which he can use as he best thinks fit; and each family is very jealous of any infringement of the boundary of their portion by any other family.

Their agriculture is very simple. The plants cultivated are the sweet potato, arum, sugar-cane, and dracæna; plantains and bananas, requiring no attention.

They make fishponds in the course of the streams, for a long distance from the sea.

They are a fine-looking race of people, a good deal like the New Zealander, the men in height rarely above five feet ten inches, well formed, though rather slender limbed, as a rule; the women much smaller in proportion than the men; their colour a light olive brown, even as light as an European, and though the lips are full they have no negro expression.

They used to tattoo elaborately, that of the faces of the women was restricted to a few lines on the lower lip.

The lobes of the ear are perforated, and the hole so enlarged as to carry an ear ornament of even two inches long.

They remove all the hair which they deem superfluous by plucking it out. The hair of the head is dressed in various ways by the men. They usually shave *paths* in it, so to say, as you see by the sketches; but, strangely, the women do not seem to care to put themselves to any trouble in its adornment.

Their ordinary clothing is very scanty, that of the men frequently the maro only; that of the women a loose robe of tappa (native paper-cloth), which reaches from the waist to the ankles. If the sun is very hot, a part is thrown over the shoulders.

They are very fond of the bath, and anoint themselves after it with cocoa-nut oil.

Marriage is a very voluntary affair, and they couple and separate when they will. The children may stay with either parent. While married, they are constant; and I do not think polygamy was practised.

Circumcision is a religious ceremony, and takes place at nine years of age.

Their houses are of matting and wood, and very well made, unequally gabled. Along the more upright side is the sleeping place, divided at five or six feet from the wall by a row of cocoa-nut logs, and at the wall is another set for the pillow. This space is covered with beautifully-made grass mats, that between it and the door being neatly paved with rounded stones; and it is kept very clean. To prevent damp, they are erected on squared platforms (called Pi-pi), four to six feet high, sometimes in two ascents, and made of large irregular-shaped stones.

It is *taboo* to wash the inside of a house.

There is no fire-place, that for cooking being an outside oven, a shallow, square, stone-walled pit. After having kindled a fire sufficient to heat the loose stones put into it, the food to be cooked is wrapped in the leaves of the arum, or banana, and put on the hot stones. The whole oven is then covered up, and after the time judged sufficient the food is removed. Pork is particularly nice when thus cooked. The staple food is *poe*, a paste made of bread-fruit or plantains, which is allowed to turn a little acid before it is eaten. To us the taste was abominable. For drink they

use, as a rule, water; but for stimulants, *ava*, or palm toddy, or orange or vee-apple spirit, or any European spirit they can obtain.

#### CUSTOMS.

*Burial*.—Their mode of burial is singular. The corpse is put into a canoe, or wrapped in a bale of tappa or matting, and laid on a bier, raised on posts to some six or eight feet above ground. It remains there till decomposition has ended, then the bones are carried up into the mountains and hidden.

*Tattoo*.—Tattooing is not merely for ornament. The different parts of the body and limbs so marked are supposed to be by it exempted from disease or pain. This discoloration, common enough through the world, is thus caused in Nukuhiva. The staining material is the soot of the candle-nut (*Aleurites*), rubbed into a paste with water. The implement is the serrated edge of the wing-bone of the tropic-bird (*Phäeton*), which is put on the skin and tapped with a wooden mallet.

The lines about the lips are a spell against toothache and hunger; those about the eyes for keen sight; those on the chest, against javelins and musket shot (I may mention that they are ignorant of the use of the bow); about the joints, to ward off rheumatism or sprains. Lads were tattooed at fifteen years of age. The lines about the eyes were the first made, and while they were being made the patient was secluded and dieted to prevent inflammation of those organs. Although the practice is now suppressed, and made a punishable offence, by the French, I was, in 1869, in a tattoo-house seeing its performance. I must say, the natives did not manifest the stoicism of Fenimore Cooper's wild Indians.

*Sorcery*.—There is in these islands a class of people

called Umokoo and Manikaha (Fasteners and Sinnetworkers). They are sorcerers, and work by means of roots, and prayers to the god Tupaamo, who causes the death of their victim. The Umoko causes sickness and death, by working on the spirits and vital energy of those who come under its influence; the Kaha, by preying on the body and mind. Both are fearful weapons in the hands of those who wield them; and there is no islander, from the High Chief to the lowest commoner, who is not afraid of the sorcerer. More deaths are attributed to sorcery than to any other cause. If anyone dies from fever, consumption, or old age, the people usually ascribe it to the influence of Kaha. A fall from a tree, drowning, death from a bullet; yes, the man was under Kaha. Miscarriage, or still birth? Kaha was present in the mother. So that all ailments are ascribed either to Umoko or Kaha; and if anyone in robust health is told he is under the spell, he will most probably sicken in consequence.

The sorcerer does not practise his art till he is forty years old, and to become an adept a long apprenticeship is necessary. Therefore, an old sorcerer usually selects, from childhood, some member of his family to follow in his steps. Large fees for tuition are demanded from anyone not of the family. As early as possible, prayers and incantations are learnt by the pupil. At certain seasons, master and pupil dwell together in a house, tabooed, in the strictest seclusion, not communicating with the outside world, living very regularly, and bathing in salt water. A sorcerer rarely exerts his power on his own account, but receives fees for putting the enemies of his clients under the spell, and similar fees for relieving the same people, so that the sorcerer's family get large presents.

These two classes of sorcerers are also quite distinct; the one, as a rule, not having any knowledge of the art

practised by the other; very rarely is one sorcerer an adept in both methods.

1st. The Umoko, to exert his art, must first get the spirit of his intended victim into his power. To this end he uses two instruments, a cocoa-nut leaf and a bowl of water. After retiring into his sanctum, he invokes by prayer the aid of his god Tupaamo. If the god is propitious, on looking into the bowl of water the spirit is seen at the bottom of it, and there the sorcerer secures it. Should the cocoa-nut leaf be preferred, it must be planted in the path of the person to be affected, on whose stepping over it the spirit leaves the body, and enters into the leaf.

After thus obtaining the spirit, the sorcerer again prays, and according to the character of the prayer, or incantation, so is the intensity of the pain, or duration of the life, of the victim.

In case of suspected theft, when the sorcerer has detected the thief, he puts him under a spell, to be removed only by confession and penalty-fee.

2nd. Kaha is performed thus by the adept. A piece of matting made of cocoa-nut fibre, eight inches by three inches, is tied up so as to represent an image, with a head, two projections for arms, and two for legs. A band crosses the trunk at the chest, and on this is placed the material to be worked upon. The adept retires into privacy with this, taking plenty of *kava* (intoxicating drink), *pōe-pōe* (breadfruit dough) for food, also some of the saliva or dejecta of the victim, or some piece of the clothing he is in the habit of wearing. The preference is given to the first two, as least liable to be followed by mistake.

Tribes, families, and individuals at feud employ these sorcerers, and take care not to leave about or behind them anything which may compromise them. Their dejecta are concealed with the greatest care, after the manner of cats and

wild beasts. The material to be worked on is called *Momo*. Placing it on the cross-band of the doll, the sorcerer invokes his god. If the prayer is efficacious, the victim soon becomes affected, but as long as the image is suspended there is no fear of death. To accomplish this the Kaha must be buried, and the time which must elapse before its occurrence is dependent on the depth of the grave—the deeper the sooner; but the victim may linger for months if the Kaha is only just covered with earth.

*Cannibalism.*—The Marquesans were notorious cannibals, and even now (1869) it is a custom in Hiva-oa (Dominica). Far from being an alimentary practice, it is usually consequent on revenge or religious observance, though in times of extreme scarcity the people of Nukuhiva have eaten their wives and children. This is the history of one feast which happened in Nukuhiva some few years since. Two chiefs quarrelled, and one was treated with indignity. On his return to the tribe-valley, he caused the war-drum to be beaten, and sent cocoa-nut leaves, "The Fiery Cross," to other valleys. Where these were accepted, it was a proof the people would come to his feast.

The French, who had a settlement in the island, tried to appease the quarrel and settle the feud. But the chief replied that the usages of his fathers, which had fallen much into desuetude, would now be revived. After much negotiation, the head chief of Nukuhiva was persuaded to collect a force and stop the quarrel; but it led to a series of petty squabbles and reprisals, in the course of which sixteen people were eaten.

My informant, who was never, of course, present at these feasts, but which, he says, even now exist, told me the origin is usually revenge, not a craving for man's flesh. Far from longing for man-meat, he had seen cases where the loathing to eat it was extreme. Sometimes the portion was secreted,

or buried ; and always, before *this* particular aliment was served, plenty of pork and fowl was used. The flesh was highly seasoned, and yet frequently uncontrollable nausea was produced.\* I remember our guide, in the Akani valley, on our arrival at the place, platform and pit of the cannibal feast, telling us that the reason of the banquet was scorn and revenge after a fight. He pointed to the place where his brother was killed. He said, "There were too many opponents killed to be eaten," but he never said he enjoyed it ; quite the reverse. The bones of the arms and legs were removed by incisions down the inside of the limbs ; the body was eviscerated. It was all made into a bundle, and cooked in the oven, having been wrapped up in taro leaves. I may say, the head was not so used.

*Creed and Cultus.*—This is always difficult to find out amongst savages, unless during a protracted stay ; yet, on their original monotheism, their belief in O'Atua or Atea, the root of the cause, the God of Gods, primal and omnipotent, much addition of subordinate divinity has been engrafted. Now, it seems that their only belief of a God is some spirit of the dead, which will come at all times of want, sickness, or hunger. Each has his own "profession-god," so to say. The fisherman's is Ko-iki, god of luck ; that of the landsman, Potini, god of plenty, and so on.

Now, too, they have no idea of after-life, annihilation seeming their end ; but warriors were supposed to be in a paradise ; and they think the spirits of their dead can revisit them, and they revere the *manes* of their ancestors. It is very involved.

*Taboo.*—This is in force here, as well as in most Polynesian islands, where the chief is high-priest as well as ruler. If he draws this magic circle, so to say, round any man,

\* Marcoy, in his *Journey across South America*, 1873, notices analogous circumstances among the Messaya tribe. Vol. iv., p. 448.

native or foreigner, his person is inviolable ; no one would dare to injure or molest him. Hence most foreigners, who are castaways or runaways, are under this rite, and many have lived peaceably for many years in these cannibal islands.

The same ceremony is applied to crops, or tilled ground. It is then called *Rahui*.\*

There is, of course, some sign of the crop or ground being tabooed. In Easter Island, as I have shown, this mark was a number of little cairns of whitened stones, so as to warn anyone against the sacrilege he would incur by infringing the rite.

*Human Sacrifice*.—This was in use here, as in many other islands. When things had gone wrong,—defeat, failure of crop, or sickness,—the priests declared a victim was necessary. This was generally a stranger from some other island. If none was to be had, some families had the unenviable distinction of being able to furnish a victim most pleasing to the gods. One was selected, and tabooed, so that even his most intimate friend could not tell him of his fate. Certain persons, to whom a black stone was given, were selected for his death. He was generally stunned by a club and killed at some unguarded moment, but in case of resistance overpowered and killed. The corpse was brought to the appointed place, some open spot near the village. The whole tribe collected, and celebrated the sacrifice with dance and chant, while the victim was being suspended to a tree.

The man who had been sacrificed just before the arrival of the *Portland*, at Oahuga (Washington Island), was a native of Hiva-oa (Dominica). He was hung up not far from the anchorage.

*Visitors*.—From the position of these islands, with regard

\* On the occasion of a cricket match, near Honolulu, in 1853, the ground was tabooed by King Ka meha meha, so that the valuables, etc., of the players should be safe from the pilfering of the natives. I was assured it was "quite a charm."

to the sperm whale fishery, they are very often called at by the whalers for supplies, and for years natives have been taken for a cruise in the ships. Many of the sailors, also, have deserted, and lived on the islands. Some men have acquired lands and herds, as, for example, Captain Johnson, who owned a considerable farm in Oahuga, at the *Portland's* visit, 1852. He had several Europeans in his employ. He supplied the whalers with "fresh meat and vegetables" when they called. Of course, he and his men were "under taboo," and had no fear for their personal safety.

When the *Topaze* anchored at Vatihua, in 1867, we found a Birmingham man, of the name of Josiah Upton. He was "tabooed," and under the strict surveillance of the chief's son, who acted as his body-guard, and was seemingly much attached to him. He had been for years on the island, and had taught some of the islanders to read and write. We helped him, I remember, with stationery and books. He was very infirm, and said he did not wish to leave; he was unable to gain his bread in England, and was most tenderly cared for by the natives. He said he thought there were about twenty-five runaways in the islands.

#### LAWSON, AND THE DELUGE LEGEND.

Thos. C. Lawson, from whose dictation we copied several legends and chants, was an Englishman, mate of a whaler, which he left in 1843, and so had been in the various islands some twenty-four years. Till 1864, he had good health. His age was about forty-seven.

He seemed a very intelligent man, and did not appear to have any preconceived notions as to the meaning of their chants, etc. He was very frequently on board H.M.S. *Topaze* during our stay.

He had heard these chants constantly among the people, among whom they have been transmitted orally for many

generations. When he formed the plan of compiling them, he copied them from the dictation of the oldest chiefs and people, as Sir G. Grey did those of New Zealand.

He says he does not remember to have ever seen any picture writing or hieroglyphic used. Hence many *hiatus* occur, and some of the sentences are so obscure that, though he is a perfect master of their talk, he cannot at all understand them. Some legends he tried to put into English, in the same metre as the original, and, though he has preserved the meaning of the words, the diction is puerile.

On our making further inquiries, he said it seemed to him that this people must have migrated from the East.\* They say so, and their tradition confirms the idea.

He readily gave us these legends, but asked us not to publish them, as he was aware of their imperfections, and was still trying to fill up the gaps; hence I have refrained till now.

#### Migration of the Islanders. By Lawson.

*Resting Places.*—The following are the places at which the natives say they halted on their journey from the East.

- 1 *Vahitaki* . . . Shining place; glorious land.
- 2 *O-au-mi* . . . Large, flat; leaves grow large.
- 3 *Papa nui* . . . Large, flat island or plain.
- 4 *Taki-hee* . . . Shining road; fair, glorious.
- 5 *Te-me-a-ai*. . . A place of plenty.
- 6 *Tapu-oua* . . . The sacred spot.
- 7 *Ani-taki* . . . Shining sky.
- 8 *Havaii* . . . Difficult passage; dangerous journey.
- 9 *Tetu-uma* . . . The gift; place given.
- 10 *Matako* . . . Place with precipitous coast.
- 11 *Pi ina* . . . Place of rest or stay.
- 12 *Tai-houa* . . . Deep water, or sea.

\* Main land of Asia.

- 18 *Ne-a-poa* . . . Day's end ; late in the day.
- 14 *Hu-u-iva* . . . Place on one side of the place dwelt on.
- 15 *Aauna* . . . To windward, or to rising sun.
- 16 *Tatu-ata* . . . Applied to dusk, or getting dark.
- 17 *Hiva-oa* . . . A far distant place.
- 18 *Fatu-ua* . . . Destroyed ; overset.
- 19 *Moho-toni* . . . Moho is a caste or clan, tattooed down  
the breast ; the place of sound, or  
voice of Moho.
- 20 *Fatuhiva* . . . Place still further off.
- 21 *Motu-nao* . . . Last island or place.

" From their arrival at Havaii till the present time is a matter here of undisputed history, and I have not the least doubt but that they have good traditional history from Vahitaki till their arrival at Havaii, but as I do not know it at present, I leave this alone " (Lawson—conversation).

## MARQUESAN TRADITION OF THE DELUGE.

*Translation.*

The history of the Flood, Papatiki, caused by the destroyer, Te Haka Nana Atua. Told to me, T. C. Lawson, by Vehi-ite, of Hana-uhia.

The Lord of ocean is going to overflow the dry earth ;  
 A period yet shall await, yet lights opening seem ;  
 Oh, who would have thought of the great earth being  
 Deluged, oh ! by a sea flood, a coming, eh !  
 Ho, ho, the enclosure, ho, ho, the braided cord !  
 Ho, ho, here is confusion among the generations of the beasts.  
 O me, a sea ! O me, a sea !  
 O we are reserved aside from the sea !  
 Reserved in generations from the sea coming, eh !  
 Here is the generations of the beasts—  
 A sea flood coming, eh !

The generation of the whites—a sea flood coming, eh !  
 The generation of the stripes—a sea flood coming, eh !  
 The generation of the spots—a sea flood coming, eh !  
 The generation of the black—a sea flood coming, eh !  
 The generation of the brown—a sea flood coming, eh !  
 The generation of the long tails—a sea flood coming, eh !  
 The generation of the short tails—a sea flood coming, eh !  
 Oh, the sea flood is coming, eh !  
 A man in front—Eh ! the coming bearing .  
 A man behind—Eh ! the coming thousand !  
 Beasts between, then a sounding,  
 For the preserving of the generations of the beasts,  
 There must be a storied house, a room house,  
 Oh, the sea flood is coming.

Chant repeated, from "The generation of the whites."

(Beast)  
 Eh, Amo eh ! E Ta ! Eh, bear the beasts,  
 Bear them in tribes. Eh ! a long rope to bind ;  
 Oh, an enveloped house, oh, the maker and destroyer God ;  
 Oh, Hina-touti-ani ! oh, Hina to hapu motu ;  
 Oh, Hina te ao ihi ! oh, Hina te ao miha ;  
 Oh, the sea flood is coming, is coming, eh !  
 A man in front—Oh, Lord of Ocean,  
 A man in rear—Oh, the flood from the sky;  
 A turtle between. Then a sounding.  
 • • • • • • •

Tip, tip, thy ear, tis bad thus  
 To cook food for the Maker's atoning sacrifice ;  
 The priests four—stone the sacrifice.\*  
 • • • • •

The house asleep. God, maker, destroyer !†

Crushed generations stink.

Held here together are, all heaven's whole fed people :  
 The sacred upright sleep.

\* *Transactions of the Society of Biblical Archaeology*, vol. iii, p. 545.

† *Ibid.*, p. 553.

To this song sing. Maker sing !  
Boy maker arise. Maker I will.

Here is an opening out of war,  
A rain-like shadow one ;  
Held together here, all heaven's whole fed people,  
Slept while the earth did overturn and quake ;\*  
Ia has given back to the bystanders a song,  
Bystanders sing ! oh, bystanders arise, oh, sing,  
This is my will, my will—  
Here is an opening out of war,  
A war to many opened on,  
And there is coming a work here.

## PART SECOND.

Eh ! the summits new of the mountain ridges,  
Lo ! behold there, an angel-man trumpets,  
Again here. Generations in the war ;  
A message in the brain, a push in the hand,  
A trumpeting, come, push the ocean back again.  
Eh, rooms ! eh, landing !  
The Lord of Ocean, the Lord of Ocean wills it.  
Ah, quick the summits long,  
A summit new fast comes !  
Eh, you ! eh, behold ! in channels emptying,  
And seven holy things, and seven by part shall cry,  
The Lord of Ocean, the Lord of Ocean wills it.

Eh, embark ! ribs of Tanaoa,  
Embark on the sea of Havaii, thy bones,  
Ah, go forth ! thy bones, ah, go forth.

\* \* \* \* \*

Eh, rest Tanaoa on the bow, rest Tanaoa on the stern of  
the canoe,  
Eh, flap, flap thy wing, Tanaoa,  
Oh ! Tanaoa, I will thee, Hia ; why dost thou not return ?  
The north wind has returned with the heat.  
Flap, flap on thy ribs, Tanaoa, I will thee, Hia ;  
Eh, rest on the sands, Tanaoa ;

\* *Ibid.*, p. 555.

Eh, call Tanaoa, is there return ?  
 Do not go away ! eh, flap thy ribs, Tanaoa,  
*Mo-epo* Eh, the embarked ribs of "night sleep."  
 Eh, embarked-sea of Havaii,  
 Thy bones, ah, go forth ! thy bones, ah, go forth !

\*      \*      \*      \*

Eh, now he alight, the four cups, cups—  
 The Lord of Ocean wills, eh, Hia !  
 Ridges great were the ridges of Havaii,  
 Ridges new are the new surface ;  
 The kick—the stamp. There is "night sleep."  
 Bringing back a gleam of bad rain,  
 The face has brought. Like Maker that.

#### PART THIRD.

Ask, ask, the flower ? Generations new, generations gone,  
 Who is the flower above here ? Oh, this way I return ;  
 Oh, the image leg one, Maker wills it.  
 Ask, ask the standing flower, who is the flower inland here ?  
 Oh, enveloped with hair ;  
 Maker with white teeth. Maker wills it,  
 Ask, ask the flower, the inland flower ;  
 Oh, it is the Lord of Ocean, a-going to go,  
 A-going to curse the standing flower below here ;  
 Oh, the black blast, oh, the blast of black.  
 Oh, who is the flower over there ?  
 It is my face the water.  
 Oh, who is the flower seaward here ? } Repeated.  
 It is the sacred one.  
 Oh, I am the tree to replenish the earth ;  
 Oh, it is the abundance, the rainbow  
 Oh, and who is here ?—the flower, the sacred one.  
 Oh, I am the tree to replenish the earth.

#### *Same in Vernacular.*

*Te Fatu moana no hoe ia e taku tu mooa  
 He koina e vae ana, na moatea ehitu  
 Oai tutu e tomina, o te Papanui tunaka  
 Mai Tai toko, he fetu e !*

Ho ho ! te papua ! ho ho te hau hi !  
 Ho ! ia e tohu ia vavenna te tai o te puaa  
 Ho mana hake iho e tai. (Repeated.)  
 E ! ke iho etai e tai toko. E ! fetu eh !  
 Eia te tai o te tai puaa  
 Te tai toko ! E fetu eh !  
 Te tai o te mona, te tai ha hei  
 Te tai o te patipati, te tai o te papanu  
 Te tai o te kivi kivi, te tai o te huho-ou  
 Te tai o te huho poto :  
 Te tai toko, e Fetu eh !  
 He enata i mua. O Fetu amo amo  
 He enata i nui. O ta fetu tini  
 Puaa te vavenna, e toni hu ina.  
 E te tai toko, e Fetu eh. (Repeated.)

Chant repeated from "Te tai o te mona."

E amo e ! e ta ! E amo te puaa !  
 E amo etu e tai. He fau va ke enata !  
 O kaka vere oa ! O te kaka nana Atua !  
 Oh ! Hina touti sui ! Oh ! Hina to hapu motu !  
 Oh ! Hina te ao ihi ! Oh ! Hina te ao miha !  
 E te tai toko. E ! Fetu e !  
 He enata i mua. O te Fetu moana.  
 He enata i nui. O te Tau ani !  
 He Hono te Vavenna ! E toni hu ina.  
 E te tai toko ! E Fetu e !  
 Tipia tipia to puaina. He fai pe ia  
 Mea tuna ai te Atua. Ke huku ko hoko  
 Te tana mata fa. Ke huha ko huha  
 Fae momoe. Atua te Haka nana

Ami pu (hu?). Tai piau

E hau ia ko hua, e hau ia o toa ta fae huua  
 Moe te tapu tutui. Moe Atua nui  
 Ma Atua va. Atua kahi,  
 Eia e atea he tona, he tona to mea nui Ia atea  
 Eia e fetu ina he hava nei.

*Hina to ao miha*—The fallen air that desolates.

*Hono* means a turtle.

The old form of worship was by tipping the ear.

*Fae momoe*—House asleep. By this it would seem the deluge came in the night.

*He mo nu enata*.—This is the only place I know of, in the whole Marquesan mythology, where any person is represented equivalent to our word Angel. The name is derived from *ano*, to enter or penetrate; *enata*, a man. *Enata* is derived from *nata*, to bind, alluding to the binding of soul and body. It is equivalent to "sky-enter-bound."

*Tanaoa* is the name of the god of the north wind, "dark-long."

*Moepo*\*—Name derived from *moe*, sleep, *po*, night; a common name in Marquesas. One of their ancient ancestors.

"I suppose Tanaoa to be the raven; Moepo, the dove."

*Ta efa Ipu Ipu*—The four men are represented as cups, or vessels.

*Havaii*, the world before, *mata hou*, "new surface," the world after, the flood.

The new assumed names of the eight people leaving the ark are—

O Ati te Ana ti tiki vai taki.

O Kaka me van Atua niho teeia.

O te Fatu Moana.

O te Puhi keke te puhi te ono-ino.

O te mata te vai.

O te ono tapu.

O mau te anna nua.

O hau ta huna tupu fenna.

With regard to the legend I have read, we all know that there has been a belief in a universal deluge, in all countries and among all people. That of the Chaldeans you will find in *Transact. Soc. Bib. Archaeology*, vol. iii., part 2.

The Hebrew version is also well known. The Samothracian you will find in Humboldt's *Ausichten*. By the Mexican account, two people only escaped, Coxeox and Tezpi, in a bark. The Welsh deluge was caused by the bursting of

\* Found in *The Hymn of O'Atea*, *The Dirge of Take-het-het*, etc.

the lake Lleon. Two people only escaped, in an open boat. In the Peruvian narrative, some people were saved, but by climbing to caves in the Andes.

In Tahiti, the deluge is also from the sea, whose god, being insulted by a fisherman, overflowed by its waters the world; yet he saved the fisherman, his wife, and child, preserving them on an islet east of the sacred island Rai-ates. The waters rose in the night.

At p. 598 of the same vol. of *Transact. Soc. Bibl. Archæology*, you will find the Dyak tradition.

It is needless to quote more.

I will point out some essential points in the two circumstantial accounts.

In the Hebrew, sea and rain, rainbow, two bird-messengers, eight persons saved.

In the Chaldean, rain only, no rainbow (unless the "Great Brightness" may be so rendered), the earthquake, three bird-messengers, seven sacred things, many people saved. As a coincidence, mention is made of Tutu, "the generator of the gods," equivalent to Tu-Atua-Tu-a Metea of the Polynesians. (Wyatt Gill's *Songs of the Pacific*, p. 6.)

There is hardly any account of these islands of the Pacific, in which the coincidences of their legends and biblical history is not adverted to, and even in the oldest this similarity is ascribed to teaching by Europeans; but there seems no positive ground for believing that this was the case.

#### FRAGMENTARY LEGEND OF THE CREATION.—MARQUESAS ISLANDS.

High, high up in the boundless sky  
Work, work a storied mansion,  
Clear all out from within,  
The cause is now without;

The sons of O Atea arrive, come;  
The sons of O Atea enter the house;  
O Tu Mea! stand thou with me here;  
O Natia, te pu! stand thou with me here;  
O Natia, te pu, the king of heaven;  
O Kaka me Vau, the white tooth god;  
O Atu to au hua, the image leg one;  
O Mauiki, the god of fire;  
O Maui, Mauiki's younger brother.

\* \* \* \* \*

## REMARKS ON THE INTRODUCTION OF GEOLOGICAL MAPS.

By GEORGE H. MORTON, F.G.S.

WILLIAM SMITH, who is justly considered to be the father of English Geology, circulated his *Tabular View of British Strata*, in 1799,\* and after he had explored the whole country, and discovered the superposition of strata, completed his Geological Map of England and Wales in 1815. Although the first Geological Map of England and Wales was the work of William Smith, the *idea* of such a map did not originate with him.

There are many parts of the country where the difference between the rocks extending over definite areas is so remarkable, and their economic value so various, that the importance of a map showing the granite and the slate, the coal strata and the red sandstone, or the chalk and the clay, must have been suggested to observant minds long before. The practice of mining must at an early period have directed attention to the range and outcrop of the stratified rocks, and the direction of mineral veins; in fact, this is evident from the *Philosophi Clariss De Re Metallica*, a work by Georgii Agricola, who lived in the sixteenth century. Some of the numerous plates with which it is embellished prove that stratification, mineral veins, and faults, were all understood in his time. There are no maps, but a series of

\* The author acknowledges much information derived from the following reliable sources, which may be consulted for authorities and fuller details:—

Introduction to the *Outlines of the Geology of England and Wales*, by Conybeare and Phillips, 1822.

"Notes on the History of English Geology," by Dr. Fitton, *Edinburgh Review*, Feb., 1818. Re-edited *London and Edinburgh Philosophical Magazine*, vol. 1 and 2, 1832-33.

*Memoirs of William Smith LL.D.*, by John Phillips, F.R.S., 1844.

woodcuts showing the strike of the veins with regard to the contour of the country.

*A History of Pembrokeshire*, in MS., by George Owen, Esq., of Henllys, Lord of Kemes, &c., dated 1595, in the reign of Elizabeth, was published by his great grandson, Richard Fenton, Esq., in the *Cambrian Register* for 1796. In the manuscript the author describes the extent and range of the limestone underlying the coal strata of South Wales, and there are observations recorded, with examples of geological surveying, that it would be difficult to improve even in the present day. An extract from this History, containing what relates to coal, has been reprinted in Fenton's *Historical Tour through Pembrokeshire*.

In the *Philosophical Transactions*, for 1684, there is a Paper bearing the following title:—"An Ingenious Proposal for a New Sort of Maps of Countries; together with titles of sands and clays, such chiefly as are found in the north parts of England," by Martin Lister, M.D., from which it seems that the author was the first who proposed "Maps of Soiles," though it does not appear that he made any attempt to carry his design into execution. He, however, mentions the divisions he would have adopted for Yorkshire, and how the various deposits might be distinguished by different colours and shading. On the title of the Paper it is stated to have been drawn up about ten years before, and delivered March 12th, 1683, which seems to imply that his priority had been questioned.

The writers on the Deluge were numerous about this period, and the speculations as to the cause of the supposed flood are very curious. Burnet's *Theory of the Earth*, in 1697, contains numerous plates and maps, showing how the earth was fissured by the sun's rays, so that it burst, when water from the interior covered the surface. There is a map

showing the drowned earth, with the ark supported by guardian angels, but nothing like a geological map.

In the *Itinerarium Curiosum*, by William Stukeley, M.D., 1723, there is an article in the index, entitled, "Memoirs towards a British Map of Soils." The author gives a list of strata, viz:—

Chalk,	Red earth,
Freestone,	Coal cliffs,
Limestone,	Coal,
Marl,	Lead, copper, &c.,
Yellow earth,	

from which we may conclude that the order of the formations in England was known to possess a regular sequence. About the same time, John Strachey gave a similar succession of strata of Somersetshire.

In 1780, Christopher Packe, M.D., produced *A New Philosophico Chorographical Chart of East Kent*. It was a map showing the contour of the country, with the "stone hills" and the "clay hills," proving that the author knew the difference between the chalk and inferior deposits traversing the county.

Guettard, in 1746, was, perhaps, the first to try to carry out the idea of Lister, many years before. He divided the formations into three grand zones, viz.: the schistoze, the marles, and the sands. He endeavoured to map Europe, Canada, and Asia Minor; in fact, he attempted so much, that he failed altogether.

Lehman, in 1756, supposed the coal strata to be the lowest rock in the stratified series, an opinion very generally entertained at that time.

In 1760, the Rev. J. Mitchell, in a paper "On the Cause and Phenomena of Earthquakes," published in the *Philosophical Transactions*, enters fully into the regular succession of the stratified rocks. The following section was found

after his death, bearing the London post mark of November 21st, 1788 :—

Chalk	- - - - -	120 yards thick.
Galt	- - - - -	50 "
Sand of Bedfordshire	- - -	10 or 20 "
Northamptonshire lime and Port-		
land limes, lying in several strata	100	"
Lyas strata	- - - - -	70 or 100 "
Sand of Newark	- - - - -	about 30 "
Red clay of Tuxford, and several		
red marls	- - - - -	100 "
Sherewood Forest, pebbles and		
gravel	- - - - -	50 "
Very fine white sand	- - - - -	? "
Roche Abbey and Brotherton limes	100	"
Coal strata of Yorkshire	- - - - -	? "

Another work, published in 1797, was entitled :—*Historical Atlas of England: Physical, Political, Astronomical, &c., from the Deluge to the present time.* By John Andrews, Geographer. The work seems to be incomplete—perhaps unfinished—but it contains a series of small maps (18 inches by 12 inches), containing the “yellow limestone” and the chalk ranges of hills.

Many other works containing maps might have been mentioned, but there is no evidence of stratigraphical knowledge on any of them. They are all either “Physical Maps,” “Mineral Maps,” or “Maps of Soils,” and there does not seem to have been anything resembling a geological map before 1790.

A mineral map may be defined as having the respective portions of the surface so coloured as to indicate the areas occupied by certain rocks or minerals, with regard to their lithological characters only. A map of soils indicates the

distribution of particular kinds of soil in an agricultural sense—not the mere vegetable mould, but the underlying clay, or sand, which is always intimately connected with the regular strata beneath. A geological map, however, not only shows the extent of each area occupied by the respective rock formations, but it indicates the relative position and relative age of each, with such further particulars as the size or scale of the map admits of.

Between the years 1790 and 1800, the Board of Agriculture published several volumes of Reports, containing much information; and this Board undoubtedly produced the earliest geological maps of any part of England, though they are very rudimentary when compared to the elaborate results of the present time. The Reports for 1794 contain maps of Devonshire, Nottinghamshire, Derbyshire, and the North and East Ridings of Yorkshire. Between 1794 and 1813, the same Board published useful maps of Wilts, Gloucester, Berks, Bedford, Surrey, Sussex, Lincoln, Cheshire, Lancashire, Durham, and many other counties. The primary object was to show the soils, but in many cases the stratified formations were at the same time defined in a rough fashion, so that some of them may be considered to be geological maps; for though there is no indication of stratigraphical knowledge upon them, the sections by Stukeley and Mitchell prove that the general order of succession of the strata had been known long before. In the absence of palæontological knowledge, it would have been very difficult, if not impossible, to have produced a map showing any minute subdivisions of the strata. The Board map of Lancashire defines the area of the Coal Measures and Carboniferous Limestone, and must be considered a geological map of the county; but those of the East and North Ridings of Yorkshire are little more than maps of the soil;\* however, these three maps may

\* The three maps were exhibited—from the Liverpool Library.

be considered average examples at the end of the last century.

Up to this period geology, as a science, had no existence. Fossils were collected and treasured up with great care, particularly in the neighbourhood of Bath, where there were many fine local collections, but very little was known of the exact relation of the fossils to living types, and they were principally regarded as curiosities. William Smith was the first person to point out their distribution along certain definite horizons, and that the same strata could be identified in distant localities, by the fossils they contained. His *Tabular View of British Strata*, circulated in 1799, was not printed, but manuscript copies were distributed, written by the Rev. B. Richardson, from Smith's dictation. The following is a copy of the original document, presented to the Geological Society in 1881 :—

*Order of strata and their imbedded organic remains in the vicinity of Bath; examined and proved prior to 1799.*

	Thickness.
1 Chalk	800
2 Sand	70
3 Clay	30
4 Sand and stone	30
5 Clay	15
6 Forest marble	10
7 Freestone	60
8 Blue clay	6
9 Yellow clay	8
10 Fuller's earth	6
11 Bastard earth and sundries	80
12 Freestone	30
13 Sand	30
14 Blue marl	40
15 Lias blue	25

16 Lias white	- - - - -	15
17 Marlstone, indigo, and black marl	-	15
18 Red ground	- - - - -	180
19 Millstone.		
20 Pennant street.		
21 Grays.		
22 Cliff.		
23 Coal.		

In the original, there is a list of "Fossils, Petrifications," &c., and "Descriptive Characters and Situations," which are omitted. This document was extensively distributed, and remained for a long period the type and authority for the order of superposition of the strata around Bath. It was the groundwork of *A Geological Table of British Organised Fossils, which identify the Courses and Continuity of the Strata*, published many years afterwards, by the same author.

In the recent Loan Collection at South Kensington, there was exhibited *A New Map of five miles round the City of Bath*, 1799, geologically coloured, and signed "Wm. Smith," and *A General Map of Strata found in England and Wales*, 1801, by Wm. Smith, surveyor. They were presented to the Geological Society of London, in 1831, by the author; and they must be considered the earliest geological maps that have any claim to originality and correctness. The Map of England and Wales was the first attempt to show how a geological map of the whole country might be drawn. These, and similar maps and sections, were exhibited by Smith at agricultural meetings, and on other occasions. He did not keep his knowledge to himself, but so freely explained the principles on which he was working, that they were well known, and he distributed proposals for his large Map of England and Wales so early as 1801, the date of the small one referred to, which was not published. This being the case, the publication of his map was

not unexpected, for it had been the result of a life of labour, and finally appeared, after a long series of difficulties and delays, under the following title :—

*A Delineation of the Strata of England and Wales, with part of Scotland, exhibiting the Collieries and Mines, the Marshes and Fenlands originally overflowed by the sea, and the varieties of Soil, according to the variations of the substrata, illustrated by the most descriptive Names and Places, and of Local Districts*, by William Smith, mineral surveyor. In fifteen sheets, 1815. The size of the map, 8ft. 9in. high by 6ft. 2in. wide. A reduced form of the map was published in 1819.

It seems unfortunate that Smith did not communicate his discoveries and proposals, before the publication of the map, through the Royal Society, or some other recognised channel, for he would then have had his priority established in an authoritative form, before it was possible for his principles to have been applied by others. However, his extensive practice as a mineral surveyor afforded him such means of investigation in different parts of the country, that few could have competed with him, and he was finally able to produce his long-cherished object, *The Geological Map of England and Wales*, which will always remain a lasting monument of his original talent and extraordinary perseverance.

With the publication of Smith's Map, in 1815, geological maps came into general use. The Geological Society of London was established in 1807. In the first volume of *Transactions*, for 1811, there is no geological map, but in the second volume, for 1814, there are such maps of the Isle of Man, the Isle of Wight, the Hampshire, and the London Basins.

In 1819, G. B. Greenough's *Geological Map of England and Wales* was published, with more minute details. The engraving of the map itself is very superior to Smith's, so

that the colouring was executed with much greater precision and distinctness than was possible in his.

In 1822, Conybeare and Phillips produced a small geological map of England and Wales in their *Outlines of the Geology of England and Wales*. Many such maps of districts, at home and abroad, were published in the *Transactions of the Geological Society* and other publications.

Between 1819 and 1824, Smith published a series of county maps, twenty-four in number, on a larger scale than the large map.

In 1831, it was resolved by the Council of the Geological Society of London, "That the first Wollaston medal be given to Mr. William Smith, in consideration of his being a great original discoverer in English geology; and especially for his having been the first, in this country, to discover and to teach the identification of strata, and to determine their succession by means of their imbedded fossils;" and the medal was presented to him by the president, Professor Sedgwick, who gave a brief history of Smith's career, and spoke of him as "the father of English geology."

About 1837, the Ordnance Survey, and, finally, the Geological Survey, began to publish geological maps, which it is proposed will ultimately embrace the whole of the United Kingdom. These maps, coloured on those of the Ordnance Survey, are on several scales, and as complete as it is possible to make them. Of smaller, and consequently more accessible, maps, the following are the most reliable:—

*Geological Map of England and Wales*, by G. B. Greenough,

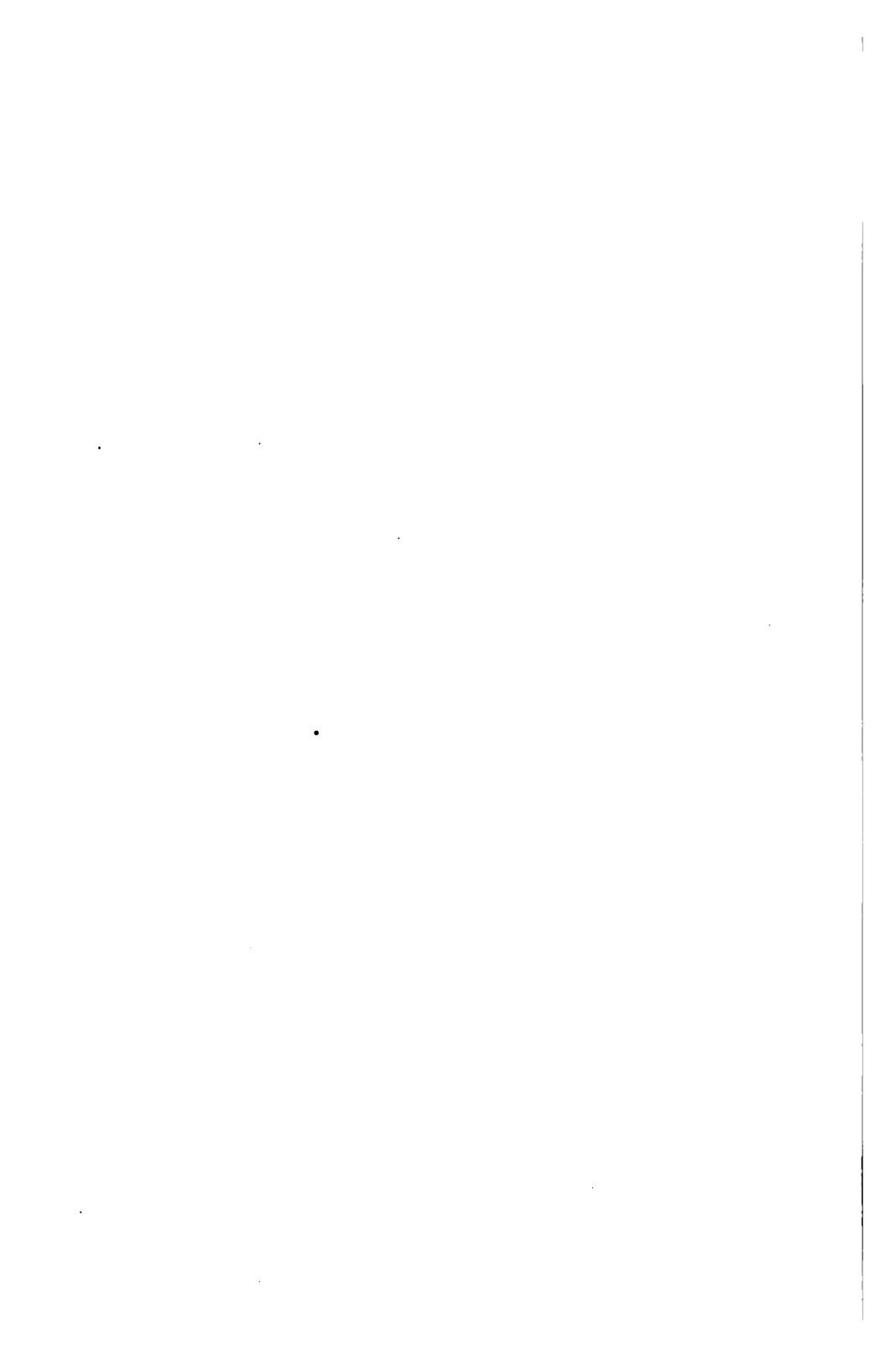
F.G.S., new and revised edition, by the Geological Society.  
*Ditto, ditto*, by Professor Ramsay, F.R.S.

*Ditto, ditto*, by Sir R. I. Murchison, F.R.S.

*Ditto Great Britain*, by Professor Geikie, F.R.S.

*Ditto Scotland*, by                         "

*Ditto Ireland*, by Professor Jukes, F.R.S.



## ON HOW WE COME TO KNOW; OR, THE FIRST PRINCIPLES OF THE THEORY OF COGNITION.

By THOS. P. KIRKMAN, M.A., F.R.S.

1. I HAVE been recently studying the last, and therefore in all probability the best, formal treatise out, on a great and renowned subject. It is entitled *An Exposition and Defence of the Scholastic Philosophy*, by the Rev. Father Kleutgen, a learned Jesuit. The work appeared in German, in four parts, in 1860 and the following years, and it is now before the world in French in four volumes. The first chapter is on "The Principles of the Scholastics about Cognition." In all books that call themselves Science or Philosophy the opening dissertation is the one to be examined sharply for pitfalls and sophisms; and, if the work is what it pretends to be, the first propositions will defy all assailants. If the book, like too many of the class, is mere rhetoric and mock-science, the rigorous reader will not require to look far for muddles and for dunce-traps. When we consider the unequalled renown with which the Scholastic Philosophy has reigned for two thousand years, and the power and learning of those who still teach it in Catholic Universities, we must allow that its doctrines are deserving of some study. All confess that the beginning of knowledge is simple feeling or sensation, the consciousness of mere changes in ourselves, accompanied with pleasure or discomfort. These are varying phases of "I am," but have not shaped themselves into "I can" and "I will," that is, varying states of conscious being, which do not amount to propositions. I do not mean verbal propositions, but what may be called virtual ones. Such, I imagine, are always really made when the

first knowledge of "I can" and "I will" however dimly dawns in us. About how we come to know in the formation of these first elementary propositions, we can perhaps talk something like sense of conjecture ; but we can lay down little that is fit to be called science, for this reason, that it is incapable of verification. We cannot repeat the process of our first lessons in our earliest infancy. And I maintain that no propositions are deserving to rank as scientific which cannot be rigorously verified. The grand discovery of Berkeley in his *Theory of Vision* is science, because it can be verified, and is verified whenever by the removal of cataract sight is conferred on the born-blind. I hope, also, that what I have had the honour of saying here, that our will-force is our only force-finder and force-measurer, will be accepted as verifiable science. About the actual first beginning of how we come to know, I hold that we can talk neither science nor sense of any kind, which is an exposition of this *how*. About this *how* of consciousness, simple sensation, memory, and the flash of volition by which I move my limbs, I deny that I either know, or possibly can know, anything beyond the fact as it is. I had the honour of giving you my reasons for this opinion of my ignorance in a previous Paper, when exposing the sophistries of David Hume about this *how*. I will not repeat the argument ; for it would be of no use except to those who are likely to ponder it as it stands in the pages of our *Proceedings*. I would rather listen to criticism of the argument by other thinkers.

2. Kleutgen's first dissertation is on Cognition, meaning all knowledge whereby we come to make propositions. There is no restriction whatever of the meaning of Cognition. The first principle is stated in large type thus :—"Cognition is the result of the generation in the knower of an image of the object known, by the concourse of the knower and of the object."

"In this principle," says the expositor, "there are two axioms. First, in the knowing subject is engendered an image of the object known; that is to say, the subject who knows puts on a certain resemblance with his object. With merely this general formula before us, it seems very difficult to doubt the truth of the axiom." I ought to have felt encouraged by that remark; but I was a little discouraged. I said to myself--this is philosophy, not poetry. I will stand no tropes nor tricks in a fundamental theorem. If it be scientific for me to say about my cognition of sunset, or of a cup of tea, that there is engendered in me the knower an image of the sunset or of the cup of tea, is that quite the same thing as to say that I have put on myself a resemblance to the sunset or to the cup of tea? Is the addition of the engendered image to my mental furniture the same thing as a change in my own resemblance? The correct statement of what I have in me, and that of what I am like, is hardly one and the same statement even in rhetoric, much less in an axiom of science. "O," says the expositor, "I said only a certain resemblance." I read the words once more. That word *certain* is about the funniest of all the tools of Profundity. I have elsewhere remarked upon its use in a fundamental definition of Kant, that it means exactly *highly uncertain*; and I am wicked enough to repeat in the ears of angry critics that whenever it thus figures in an axiom, or in a definition of philosophy, we have before us what I call a metaphysical mud-pie.

3. I soon saw that my teacher insisted upon his right to speak of my cognition as brought about either by an image formed in me by generation, or by a fresh resemblance put on me by assimilation. In the next paragraph (20) he tries to make me understand the "assimilation or the resemblance of the knower and the object known, which is formed in cognition." In the following paragraph (21) he affirms that "he

who knows is capable of the knowledge only by being united to the knowable object either by essence or by resemblance. By virtue of this union, cognition springs from the knower and the known as from a single principle." This is, in fact, the enunciation of the second axiom in the first principle which heads this chapter.

I began to suspect here that I saw handled, not a set of scientific terms, but a set of tropes that could be exchanged at pleasure, and from which, doing duty in premisses as scientific terms, a great variety of conclusions might be deduced in the most natural manner possible.

4. To the first axiom laid down in the principle no man can object in a piece of popular rhetoric. My knowledge of many things is so precise in number, measure, and minute detail, and so easily verified, that it may without any harm be said of me that I have in me an image of the object known. But I say that this affirmation of an image of the object, either engendered or otherwise wrought in me, is very far from being accurate science, all slippery tropes being excluded. For nothing can stand as a theorem of exact philosophy which is not capable of verification by an appeal to facts of passive or active experience. There is no ambiguity or uncertainty in my conviction that I know many things; for I can prove my knowledge by laying down a number of clear propositions about things which cannot be denied, but can be rigorously verified in time, place, and number; and that is the only exposition and the only proof of my knowledge that any philosopher can demand of me.

5. But if I choose to assert that there is in me or in my possession, mentally anyhow, an image of the sunset, of a horse, of a river, or of a cup of tea, how am I to set about verifying this, figures of speech being excluded? An image and that which it represents are familiar experiences without tropes and metaphors. I can look first at one and then at the

other. I can place myself between the original object and the likeness, or set them apart before me and judge of the resemblance. But if I place myself in view of the sunset or of my cup of tea, admiring the one or handling the other, what am I doing ? I am merely repeating my cognition of the one and of the other. What am I comparing ? Simply my present cognition with my memory of previous ones. I cannot place myself between my object and the cognition that I choose to call its image, nor can I set the two apart before me. This impossibility in the attempt at verification is proof that the word image that I have used is a harmless trope, and not a term of science at all.

6. These tropes of my image of the object, and of my union with it by my resemblance, are not the only ones employed by the scholastics and their learned expositor. He continues thus, in the passage quoted above in (2) :— “ Whatever thing we know, we possess it, in a certain manner in ourselves, and that precisely by our intellect. Now, it is impossible for the intellect to appropriate the object as to its physical being ; it can therefore only possess it by imitating it, and by reproducing it in itself, in a manner which corresponds to the nature of the intellect, or by engendering it as it were (*en quelque sorte*) anew.” “ The representation whereby a man conceives his own essence is nothing else but a reproduction of that essence engendered in the reason.” How the writer succeeded in the conception of his own essence, or how he found out that he was conceiving exactly that, he does not inform us. But he shows us how theologians teach that the Word is the Image of the Father, by proceeding from Him by the way of intellectual generation.

7. The term *possess*, above introduced, with the decoration “in a certain manner,” is something in rhetoric, but nothing in science, or nothing but a mischievous germ of sophism. Nothing is properly possessed by me which is

equally the possession of others, and of which I cannot divest myself. It is curious to see here how the trope *possess*, by figuring in a premiss, is made to guarantee the more wonderful terms *reproduce* and *engender anew*. What a charming machine we have here for the manufacture of scientific conclusions ! We shall presently see to what sublime results we are led by carding and roving of these terms of *image*, *assimilation*, *union*, *possession*, *appropriation*, *generation*, and *reproduction*. In the next paragraph we read : " Not every resemblance makes a thing into the image of another ; this term *image* is reserved to the resemblance which is formed *with the intention* of imitating or reproducing another thing. Now the resemblance of the knower to the thing known does not consist of necessity in the sameness of essence : if it were so, we could know nothing but what is of the same species with ourselves." He has remarked above in the same page, that things are said to be of the same species which are alike in their essence. " We thus come at the meaning of the scholastics in their affirmation that things are knowable because, besides the real physical being which they possess, they can also have another, an *intentional* being, or we may say an ideal being, in him who knows ; and further, that a principle or agent becomes a knower by receiving, in addition to the being which is his own, also the being of something else." These words are to be taken as quite in literal earnest by the student who seeks to apprehend the full meaning of the first principle before us, and to know how the image is engendered in the knower by the concourse of the knower and the known. The scientific result is that the thing known acquires a second being, called *intentional*, in the intellect of the knower, while the knower himself acquires and verily possesses by union of essence or resemblance, in addition to his own proper being, the being of the thing known. That appears to be the effect of this generation by concourse.

8. The climax is to come. I am still quoting : "In order that cognition may take place, it is undoubtedly necessary that the *form* of the object known, that which distinguishes the object, should actually be in the knower ; but it is not necessary that it be in him present in the same way as in the thing known. . . . The intellectual image contains what distinguishes things, that is to say, their accidental or substantial *forms*, in a manner different from that in which they are found in the things ; in other words, without their material and changing being" (§ 24). Again he says : "Hereby we see at once why things material are in us by cognition in a manner more perfect than that in which they exist in reality ; or, as Thomas Aquinas puts it, 'cum in ea [anima] res ipsæ nobilis esse habeant quam in se ipsis.'"—*De Veritale*, q. 15.

"Herein lies the perfection which belongs to the cognitive principle as such ; for cognition is possible only on condition that the thing known is in a certain manner in the knower." (§ 31). "The soul is capable of appropriating things by cognition not only as to their phenomena, but what is more, as to their essence, only by virtue of the immutability of its own substance. . . . Hereby we see in what sense the scholastics say with Aristotle that our intellectual nature, that which in us is indestructible and eternal, can become all things. . . . The human soul can by cognition grasp and embrace the perfection of the whole universe" (§ 32). "De anima dicitur, animam esse quodammodo omnia, quia nata est omnia cognoscere." (*De Veritale*, q. 2., a. 2.) "Cognoscendo vero omnia intellectus quodammodo fit omnia, et trahit ad se perfectionem omnium rerum. Hinc est, ut homo præcipue per intellectum sit microcosmus, quia quot species rerum sunt in mundo, tot possunt poni intentionaliter in intellectu."—*Maurus*, quæst. 4.

Wonderful things did those saints and sages with their

*quodammodo.* The *quodammodo* was their magical wand of universal mastery.

9. How thoroughly in earnest all this is, can be understood only by those who know what the scholastics meant by the *form* of a thing, namely, not the mere shape and figure, but all that bestows on the thing a true substantial and determinate being. The *matter* of a thing they affirmed to have no substance or determination whatever, and to be, by itself and without some determining form, utterly incapable of existing. They allowed matter by itself to have a potential *essence*, but no possible *existence*, *per se*, whatever. They scorned all theories of *atoms*, while they affirmed material things to be substances only by virtue of the union of their matter and their forms. In the transformation of substances by fire and other destroying agencies, they held that the form perished, but not the matter, which merely became instantaneously invested and determined by a new form, thus becoming another substance. But if all form were to be withdrawn from the matter, that forsaken matter would be a *non-ens*, having no existence, but only a mere potentiality, or *posse*. This the scholastics considered to be quite intelligible.

10. Whatever I may think of the use made by the scholastics of the trope *form*, I largely approve of their notions and definitions about matter. They are incomparably more philosophical and free from assumptions and bad logic than the dreams of our materialists about their atoms and their ether.

It cannot be denied that there is sound reason for the resolution which those acute thinkers insisted on making of the objects around us in the cosmos, animate and inanimate, the double resolution, into two factors. These two factors of a body, when we consider the transformations which take place in time, as of grass into beef, and of water and sunshine

into grass, are matter and form. The two factors, when we consider a body as it is at this moment before us, are substance and accident. But my notion of the formless matter and of the underlying substance is not theirs. One thing they seem to have overlooked in their conception of the result of the withdrawal of all form from the formless matter ; which is, that the locus in space of the body would remain, a locus of geometrical points, after the complete withdrawal of the force-points, as well as the path in space which had been described up to the time  $t$  by the body and its parts, a path described up to the time  $t$  by no other body. That *perdurabile* is there forever, and can be retraced by a thinker who is master of the acting forces. Into this I cannot further enter now. I can easily pardon the little boasting of the scholastics about their knowledge of substantial and intelligible forms, for the sake of the sound philosophy which they talk about matter, compared with the doctrine of that matter, of which, with his mother Must-be, so many of our superstitious *savans* are now singing out—"These be thy Gods, O Israel."

I shall not attempt to follow the learned Kleutgen in his further exposition of the wonderful theory of *intelligible forms*, by which we come to know things and to retain our knowledge of them ; still less shall I touch the more wonderful theory of Abstraction, whereby, according to the scholastics, we pull off or drag off the forms from the phenomenal objects around us ; nor shall I try to shew you what is "abstrahere formas à phantasmibus."

11. In vain do I search into the mystery of how I came to know. I can make my guesses, but the process will never be unravelled. There was a time when I hung on my mother's breast, little more than a changing sequence of purely passive impressions. As I drained that blissful fountain, I was pleased with the warmth and softness that

cherished the little hand which I knew not was my own. Not less was my delight from the beaming eyes, the wreathed smiles, and graceful ringlets that tossed in love and ecstasy over me. And when my fingers, in their random gladness, chanced to clasp upon the ringlet, I was pleased with the charming image of my own white arm, as it was lost or revealed in that flood of flowing hair, and I felt with a pleasure like my mother's rapture my own strength, as I tugged at the silken coil. But all was chaos—there was yet no unity—there was yet no virtual proposition. On another occasion, as I rushed to the same joy and resigned myself to the same heaven, the memory of previous delights stood steady there ; and as the beautiful tresses hung over me again, tempting my baby hand, I virtually said for the first time, "I know that lock, I know that I can grasp it, and I will." I put forth a conscious volition. I succeeded in the effort. It burst upon me that the dusky sheen and the straining softness were both in one ; and my guardian angel clapped his hands to see that I had learned the first lesson of unity and reality in God's world of mercies and of wonders. Such meditations may be worth something as part of my religion ; but they are not science.

12. It will now be pretty plain to my hearers that my object in reading this little Paper, is not to display my knowledge, but my ignorance, about how we come to know, and to give very good reasons for thinking that those deep scholastics were about as ignorant as myself, notwithstanding their wonderful persuasion that they knew, and that they were true microcosms embracing by cognition in themselves the being and the essence of all things.

We have most of us felt humbled, when we have heard propounded that sublimest mystery of ontology and metaphysics, that knowing is being, that knowing and being at bottom are one. Which of us has not said, How deep, how

vast, that is ! I wish I could get round that, or get across that, somehow. Well, there is nothing to get across but a shallow wash of scholastic trope and rhetoric. I cannot see, nor will I allow till somebody helps me to see it, that this profound identity of knowing and being is anything but stuff and nonsense in the philosophy of the finite. Cognition, the sages tell us, is by virtue of an engendered image ; the image is assimilation, the assimilation is union and possession, and true reproduction of the thing known as a part of our own living being ; so that “ *animus quadammodo fit omnia* ” ; “ *anima quadammodo est omnia*. ” The knower *quadammodo* becomes what he knows ; knowing is *quadammodo* being.

13. I have satisfied myself, and I hope I have convinced you, that the great scholastics, with their pompous pretensions to know how we know, expressed of their own insight by their tropes, and called up in the minds of their pupils, not a whit more wisdom than every one of us expresses and conveys by, I feel, I perceive, I know. Why should I be ashamed to confess my utter ignorance of *how* I come to know, and of every *how* that can be propounded about consciousness, volition, memory, and intellectual cognition ? In these matters, allow me to say in all matters of science, my ignorance is in truth the grandest part of my knowledge. We have sometimes laughed, it may be, at the applications of the proverb, *omne ignotum pro magnifico*. Are you sure that we have not sometimes laughed for want of thought ? If I may confess the honest truth, I say that my *ignotum* is my *magnificentissimum*. To my soul there comes an inspiration a thousand times more sublime from my contemplation of my ignorance, than from my review of all that I know. That inspiration wells up from my admiring, undying, and adoring faith ; my exultation and my glorying in Him who does know ; in Him so near and so gracious to you and me, who

not only knows it but can do it, nay, does it, is doing it before my eyes every moment, with all the beauty of science and order, with perfect power and perfect ease, and with most benignant purpose for us all; the God in whom we live, and move, and have our being.

Even of things that should be less complex and unsearchable than the deep inward facts of consciousness, even of the commonest outward things, my ignorance is wonderful. When I am looking at a chickweed, or peering through my poor little lens at a hair upon its stem, I ask myself, What are the human cleverness and hammering in all the complexity of the Queen's dockyards, compared with the swift science and power expended on the vast manifold of that living hair? It would be a sad downfal for me, when I am enjoying the boundless prospect of my ignorance of what is there going on in my sight and out of it, if some angel were to undertake to teach me how to answer every question that my science could ask upon it. Hardly less a downfal would it be, if I were to learn that there is somewhere in heaven a Seraph who is unable to ask himself a scientific question about that hair which he does not know how to solve. For at present I do not believe that the biggest Biologist among them all up there has yet made himself quite master of the scientific theory of one single cell.

But, lo! our sublunatic philosophers —they have unravelled all life and thought down to the first structural unit, the structureless gelatinous protoplasm! There are men enough out now, and quite in the fashion with their brooms on their shoulders, as resolute as Mrs. Partington with her mop, who mean to make an end of this ignorance, and to sweep it all away. Wait a little, while Dr. Mustbeso puts the finishing touch to his evolution — just wait for the end of his gory and gloating vivisections, as hopeful as hell, and of his analyses by disintegration and undifferentiation of his infinite invis-

ble — only wait, and then you shall see — how much there is left of your Cosmos to conquer.

We have all joined, and justly joined, in the censure of certain priests of the olden time, and of certain priestlings of our own day, for their over-admiration of a venerable maxim. I shall conclude with that maxim, which has in it a nobler and more uplifting truth than we have been willing to confess in it. I venture, although aware how easily what I say can be misrepresented, to finish with this affirmation, that for you, for me, and for all the archangels of God, Ignorance is the mother of Devotion.



## ON THE FIRST DEFINITION OF THE SCHOLASTIC PHILOSOPHY.

BY THOS. P. KIRKMAN, M.A., F.R.S.

In inviting you to look more closely into the foundations and beginnings of Philosophy, I feel sure that some of you, members as you are of a learned society, will stiffly decline to imitate the exploit of the most successful genius on record in this planet. I fear that few of you are ambitious to emulate that heroic man, whose praise is in far more than all the churches, whose praise is in all the households, nay, in all the nurseries, and whose renown would be extolled by one here, if he had the opportunity, "with all his might and main," though not without an ancient grotesque of parable, in every hall of science, among men or angels. Who was that great man? Let me beg of you not to smile, because I am in real earnest:

"There was a man of Thessaly,  
And he was wondrous wise,  
He jumped into a bramble-bush,  
And scratched out both his eyes.  
And when he saw his eyes were out,  
With all his might and main,  
He leapt into a quickset-hedge,  
And scratched them in again."

That is the great model which I would set before young philosophy. It was little credit to him to scratch his eyes out: the wondrous wisdom lay in scratching them in again.

The beginnings of Philosophy, about Being, Consciousness, Cause, Will, Law, Matter, Force, Soul, Power, Responsibility—these real beginnings are to hundreds, who

can talk logic well when they get out to sea, all one thicket of cruel thorns. Again and again it has happened to me in conversation with men of acute minds, to see them recoil from the bramble-bush, while, at a distance from it, they were both loud and learned. I put a little question about a meaning for a fundamental word that shall be free from tropes and quibbles, about a definite proposition for a starting-point, about a couple of steps of solid foot-hold, and my friend waves that loftily away. He knows all that ; he is tired of that ; he knows it to be waste of time and words, and bosh unfathomable. He insists on talking where there is plenty of room ; and there is always plenty of that for men who never trouble themselves about first principles.

And thus we may go on, from quibbling sire to muddling son, for another century or two. But yet, I think, not forever. Let me tell you why I think so. Science has already scratched both her eyes in again, in one terrible thorn-bush, and her vision is clear forever. The dynamical brambles were, not two centuries ago, quite as full of blindness and despair as certain thickets that are now horrid with the prickles and tangles of thousands of years. The notions which philosophers had about mere motion, and about the way to conceive and to express fundamental truths concerning equilibrium, resisting and resultant forces, about attractions and impacts, momenta and velocities, rotations and orbits, with their simplest compositions, resolutions, and variations, the notions of deep thinkers, as to the right way into these matters, were as full of confusion and contradiction as are any questions of the present day touching the beginnings of Philosophy. These were thorns impenetrable till yesterday, when the mathematicians worked out what I believe to be by far the greatest achievement of human intellect, the six fundamental differential equations for the behaviour and position of any system of moving and interacting masses in

space, and shewed how to translate them into feet and seconds, correct at any time  $t$ , to as many decimal places as you please. How was this victory obtained? By returning again and again to the problem; by asking, at the starting-point of greatest simplicity, questions free of ambiguity; by refusing every answer that was not stripped of may-be's, must-be's, metaphors, and vague generalities; by writing what was given and what was sought in words and symbols, having each one clear meaning, and one only; by constructing a fixed sequence of plain propositions, about which dispute is impossible, and which the boys in our schools are now made to understand and exemplify with the simplest lines and numbers. This was all done by men who, instead of shewing superior light by keeping their precious noses out of the bramble-bush, jumped into it, and in and in again with all their might and main, till they had scratched in all their eyes.

If to some of you this sounds like trifling out of place, I hope there are a few present who regret with me the neglect—I will not say the contempt—into which the study of fundamental philosophy has fallen in these days of money-making and of microscopical and most desultory physical research. I confess myself to be greatly disappointed when I try to compare our enormous and costly accumulation of disjointed facts, in all departments of physics and physiology, with the marvellously small amount—since gravitation and two or three other things were discovered—of scientific insight into the close connexions and laws of the changes, apart from mechanical and economical successes—the small amount of insight, I say, which is either obtained or hopefully looked for, under clear answers expected, or even questions definitely proposed.

I see crowds of good heads busy with mere observations, obtained by rifling sea and land and sky, by dissection of the

dead and vivisection of the tortured living, observations with vast gulps of ignorance between them, which certain Newtons and Harveys of the future are to have the honour of reducing and compacting into something fit to be called science. I cannot help wishing that a few of these good heads would reconsider the determination which they seem to have made, to have nothing to do with what they call metaphysics, but which, so far as it is science written, I prefer to call *prophysics*, the first foundation of thought and certainty for the complete soul of man.

Some one may here ask, Would you have us plunge again into that bog, more offensive and barren than even the chaos of sectarian theology—the wilderness of philosophy so-called—and metaphysics? I answer, I do not recommend quite a plunge. But I think it not unreasonable to wish that we could resume so much respect for our own understandings as to say, We are competent to decide, with familiar and habitual insight, what are the first two or three questions that ought to be asked, and how to ask them in terms free from tropes and ambiguities, at the beginning of Philosophy. We are competent for something better than displaying what a hatful we know about what Plato and Aristotle said; of what Des Cartes and Spinoza said; of what Malebranche, Leibnitz, Locke, Berkeley, Hume, and Kant said. We are fit to form and to maintain a conviction of our own, at least, about the first axioms immovable that ought to be written down by thinkers, and to decide whether the first two or three questions that we say should be asked, are or are not, can be or cannot be, answered in propositions of accurate science, to be recorded and referred to forever, like the first theorems of Euclid.

If there are any here who say that it is not worth their while as thinkers to come to any decided conviction about the first steps in philosophy, I must content myself with

addressing those who happen to approve of what I have tried to do, in laying down, as so many have done before, the Cartesian axiom, "I am, and I know that I am, thinking," as the one fundamental proposition of science out of which all our knowledge of the universe logically flows.

If you be in hearty earnest in laying this down with me, you feel that it is an important thing to do, and that it is a matter which no consistent reasoner can dismiss thenceforth from his attention. If it be really the first, it must be a very fertile principle, and it is a worthy occupation for the accurate thinker to satisfy himself of the manner how everything of certainty, at the beginning of science, follows from it.

In my treatise on *Philosophy without Assumptions*, I have endeavoured to shew how, out of that radical dichotomy which we all verify in consciousness, of purely passive sensation on the one hand, and of the active utterance of will-force in thought and deed on the other, certain important first theorems flow with demonstration. I am daily more and more convinced, for not one word have I yet heard or read that pretends to assault that conviction with more than empty negations, that those theorems are as rigorously proved as they are important.

I shall go over none of the ground covered in my book. I invite you to consider one or two points not sufficiently handled there.

If we desire to continue our study of the beginning of philosophy, we cannot neglect this question—How are we to fix the definition of a host of words of which we cannot avoid the use at the beginning?

The first term in our fundamental proposition is I, the ego so renowned in speculation. Are we to define that? You smile at the idea of debating the definition of ego; and your smile would become a laugh, if I insisted on displaying my defining power there. Suppose, now, that I have some-

thing wise to say about egoity. *Egoitas, egoitatis, egoitati,* has cut in all its cases a famous figure in philosophy. Should not this be defined? Is it not a grand long word ending in -ity? So it is; but I think I had best not try to instruct you by my definition of it; and I should laugh with you at the wiseacre who should set about defining either his egoity or mine.

But a grin is no argument. We ought not to be content with laughing. We must, as philosophers, give a sound reason for our merriment. And the reason is worth stating; for in the hands of one who has the presence of mind to use it, it is a dangerous weapon against a good deal of false philosophy. It lies in the truth of the following propositions:—

1. When we have determined and agreed together which is the first fundamental proposition in philosophy, we are bound to define, when required, every fresh term that we employ, which is not confessedly a term of that first proposition.

2. It is an absurdity and a self-contradiction for us to attempt to define any term of that fundamental proposition, or of any proposition which we are agreed to use as an equivalent, or as a safe, exact, and unambiguous circumlocution, for that first and fundamental one.

To prove this absurdity, we have only to consider what is the intention of a definition in science, that is, of one which is not a mere verbal synonym—a mere dictionary equivalent. The intention is to lead the student to the knowledge of the thing defined, through some notion or proposition which is plainer, easier, and nearer to him, than the first proposition to be laid down containing the term defined.

When we have agreed as accurate thinkers that the first, absolutely the first, proposition of certain knowledge that we can possibly write down in the order of science, is “I am,

and I know that I am, a thinker," most of us can see that we stultify ourselves, and revoke the absolute primacy of our fundamental truth, if we set about the definition of any term in it; for that, in fact, is affirming that there is a position to be laid down in our knowledge which is antecedent to the very first, and nearer to us than the nearest, namely, the position through which and from which we complete the definition. The only scientific exploit which we can possibly perform is a vicious circle, which ends where it began.

I am not at all sure that everybody will see the force of this; for what is there in all philosophy so delicious and seductive as a good galop on a good donkey on a good old road, round a nice large hill? You are always going right on; you run no risk of losing yourself; for you know what you are coming to.

There is a number of equivalents and circumlocutions for the fundamental proposition, "I am, and I know that I am, thinking," where thinking stands for the act of intelligence of the moment at which I lay down the proposition. It is most important to bear in mind that this fundamental fact, so affirmed in the full import of "I am," is not what I laid down yesterday, or even five minutes ago; but the fact known to my consciousness at this moment, verifiable by the appeal to consciousness at this moment, and incapable of verification in any other way. Philosophy, which I am to think through, to assent to as the truth known to me, which I have to state in propositions, and to maintain and defend by sound logic, this is always a train of reasoned thought, which, for fresh examination and verification, can begin neither in me nor in you but at this moment. In every phase and tone of my reasoning soul, I have to posit as the starting-point this immovable certainty, that I surely know myself to be the thinker of this thought, whether it be right or wrong; and out of that, with the help of memory,

and of that will which I know I can put forth for comparison and verification, out of that alone flows the whole train of reasoning. Sometimes, in my merely passive states of consciousness, this "I am," which I am certain that I know, is little more than purely listless sensation; but, generally, when I am in quest of precious truth, I am in action, my will is at work, and "I am" rises to "I can and I will;" and whenever I am debating with a fellow-man, there towers over all the majestic presence of "I ought," and of that I know that I and he are thinking, with the clearest conviction of what is due from each of us to his brother and to truth.

I will not here go into the question whether or no this "I ought" is, when thinker speaks to thinker, an element inseparable from the fundamental proposition with which alone a formulated Philosophy can begin, and out of which alone it can logically flow. Here is matter for earnest discussion. I think it will be found by us, on further examination, that the attempt either to doubt or to define moral obligation and responsibility is no less absurd and self-contradictory than the attempt to define egoity, personality, or personal identity, will, mind, or the terms being, knowing, and thinking.

Nor will I attempt to enumerate the equivalents and the admissible dilutions and circumlocutions that may be written for the only fundamental "I am, and I know that I am." Here, too, is matter for useful discussion. It is not a trifling occupation for us to determine accurately the import of the first word which the immortal Des Cartes pronounced to that world of deriding scholastics, *cogito*. There are plenty of acute debaters who will not accept the starting-position of Des Cartes, nor be bound to its enormous consequences; for I say they are enormous, and utterly crushing to whole hosts of fashionable philosophers, before the eyes of every

sound logician who understands the laughable geometry of the vicious circle. Don't ask one of those gentlemen to write down a definite truth which he holds and is prepared to defend as the absolutely first position of all reasoning thought; you will be taking a live eel by the tail. There are no men more clever in their sallies about first principles in philosophy than those who hold no principle at all; if your demand for clearness is too close, they cry out Metaphysics, and are ready to deride alike the sceptical industry which looks for a settled definite principle and the logical loyalty which stands by it. By principle, I mean a clear fundamental proposition.

One admissible equivalent there is for the Cartesian first principle. It is this—I am, and I know that I am, a living soul. We can all agree, I presume, that by the word soul we mean a conscious being endowed with will, reason, and conscience. It is one thing to be so agreed, and another to undertake to state what a soul is, in a definition fit to take its place in science. I decline to define the soul, or a soul, or my soul, all the same thing in a general definition, for it amounts to neither more nor less than defining the egoity of me-the-thinker.

But, you may remark, it is one of your propositions that you have a soul, and that is not explicitly comprised in your fundamental principle. If that be so, I am bound both to define a soul and to prove that I have one. But I am not aware that I have any such thing, nor can I affirm that I have it, without a figure of speech, drawn from my relation to what is not myself. I no more have a soul than I have a self. I am understood well enough when I talk of myself or of my soul. But neither self nor soul expresses what I have; it expresses what I am. The truth without a trope is, I am myself, I am my soul, or I-the-thinker am a soul. Equally do I refuse to allow, as a pro-

position of rigorous science, that I have a being. I know that noble utterance : "In Him we live and move and have our being." It is an authorised text, but not quite authorised by Paul's Greek; the Greek is *ἐν αὐτῷ γὰρ ζῶμεν, καὶ κινούμεθα καὶ ἐσμέν.*

I am a being ; but only by one of those baneful tropes that we have to weed out of the beginnings of philosophy can I-the-thinker affirm that I have a being. An amazing amount of metaphysics would disappear if the phrase, to have a being, (*esse* habere, quidditatem habere) were blotted out. Under *Ens*, I read in my Lexicon, " Simpliciter dicitur *res*, quod habet *esse* ratum et firmum in natura ; et dicitur hoc modo, accepto nomine *rei*, secundum quod habet quidditatem, vel essentiam quamdam ; *ens* vero, secundum quod habet *esse*." That is, we call it *ens*, because it has an *esse* ; we call it *res*, a something, because it has a somethingity, because it has a quiddity or a certain essence. I refuse to define my soul ; you may define it if you can, and if you can do it without circle or metaphor, I will study your definition. I am bound to define my body, if I talk science about it ; that I can do by finding it and shewing you how to find it. But my body is something different from me-the-thinker. I have a body : there is no figure of speech in that.

These remarks introduce the little that I have to say about the foundations of the Scholastic Philosophy. It has been difficult for me to bring myself to speak on a theme so repulsive to most English ears. Grant me what indulgence you can. I hold in my hand a fair and very instructive sample of it, which, because of its living interest, will afford you more pleasure, or at least inflict less annoyance, than anything which I could myself have selected. This is a syllabus of a long Paper, entitled "The Soul before and after Death." It is marked private, and printed for private circulation among the members of a

philosophical society of the metropolis, previous to the reading of the Paper by one whom I shall not name, a man of great learning, who is familiar with all the philosophies. His part in the argument, in which the keenest wits of all the schools, theistic and atheistic, contend without reserve and without *odium*, is by express stipulation, as he himself has informed me, to appear clad only in the armour and wielding only the weapons of the old scholastic philosophers : and perhaps no man in England is more qualified than he for that championship. You will therefore kindly bear in mind that whatever there may be to praise or to censure belongs not to him, but to those ancient doctors from whose tomes every proposition of the Paper is extracted. I shall read to you only the short metaphysical opening. The bulk of it is a noble and victorious array of psychological and moral proofs, before which all the negations, circles, and sophisms of the fashionable matter-and-must-be philosophy are, to my captious and sceptical faculties, as chaff before the wind. I have the permission of the gentleman who wrote this syllabus to make use of it here, and he has read every word of this Paper, from which I should have expunged all allusion to his, if he had desired it. He did not desire it ; but remarks that I am imperilling my reputation as a philosopher. I can say that, like him, I care much more for the diffusion of truth than for renown in philosophy. And we have little chance of much truth of lasting importance to us, until we have learned and agreed how to talk sense, if not science, about our own souls. The truth on such a topic has a price "above rubies," even if we reach it through thorns and bleeding blunders.

I proceed to read every word of the metaphysical portion.

" 1. If I am asked for a definition of the soul, I answer, 'Est principium per quod homo sensitivus est, cogitat et vult ;' it is the principle by which man perceives, thinks, and

acts; or again, more simply, 'It is the principle of life, and of the vital acts of thought and will.'

"2. If I am asked for a definition of life, I say it is 'Activitas qua Ens seipsum movet.' By motion in man is intended not only physical, but intellectual, moral, and mental.

"3. If any one shall ask for a metaphysical definition of principle, I answer, it is 'that which produces anything.' 'Principium est id quod rationem continet, cur illud sit, cuius dicitur principium.'

"The Principle of a thing is that which contains the reason why the thing is, of which it is called the Principle. The idea of a Principle is that out of which anything proceeds, as a tree from a root, or a stalk from a grain of wheat. And yet the word 'principle' is not a metaphor of similitude, but of proportion: as a root to a tree, so a principle to its product. A root and a principle may be dissimilar in everything but the one point of production, yet the analogy or ratio of proportion holds good. The mistaking of analogies for metaphors or images is the source of endless confusion. It is like believing Providence to be an eye."

That is all. It may have been expanded in the actual delivery of the address. No doubt it was. The Latin and the formal definitions and explications are all in inverted commas. They are most probably copied word for word from Thomas Aquinas himself, the great St. Thomas, as the scholastic manuals call him.

You will at once confess that all this sounds logical and very profound. I hope you will none of you despair of mastering it, if you just try, as we go over it bit by bit. I am quite sure it is not too deep for any of us. Let us all try, taking one thing at once. First let me observe that we have no right to charge these writers with nonsense, when they attempt to define *life* and *soul*. For they do not allow

the Cartesian starting-point to be the right one. All the scholastics affirm that Des Cartes made quite a wrong beginning. For me or for you, at that starting-point, to define life and soul, would be gross self-contradiction, as I have already shewn.

We need not dwell on this Latin definition of life—"activitas qua ens seipsum movet" in the second sentence. But it is an interesting example of the defining power of those ancient gentlemen. The student is supposed desirous to know what life is, and learns this: "Life is the activity by which a being moves itself." He is in fact advised to run about till he finds a being in motion; he is to satisfy himself as best he can that self-movement is the cause of the motion; he is taught to call that by the name of activity—nothing but a word in *-ivity* would answer—and then to say, Now I know that life is the activity whereby a being moves itself. I wonder whether it ever came into the student's head that he was himself alive and active, and thereby master of more knowledge of life than he could learn by the definitions of doctors.

The scholastic soul is what we are studying. In the definition here given of soul, comes the word *principle*. "The soul is the principle of life, and of the vital acts of thought and will." Very properly we next have *principle* defined for us. First thus: "It is that which produces anything;" next thus: "The principle is that which contains the reason why the thing is; rationem continet cur illud sit, cuius dicitur principium." Then the scientific formula, "as the root to the tree, so is the principle to the product," which, as to its form of words, is properly called "an analogy of proportion."

If the scholastic doctors were here, I should say, Gentlemen, I perceive you are talking about me; what you call my soul seems to be not me-the-soul, but the principle and root

of me. I am one of the men perceiving, thinking, willing, acting, of whose being, thought, and action you scientifically understand the finite producing principle which you call the soul. I shall make it, if you please, a personal matter, a lesson to me about myself. That is my only possible way into it. We must settle first whether what you call my soul and my metaphysical principle is what I know as my conscious soul; if not, you will kindly help me to find for myself, without mistake, as really belonging to me, what you in your philosophy call my soul; and if you fail to do that, I shall beg to know how you came to discover so much in the science of the finite about a soul of mine which I have failed hitherto to observe, and which you cannot help me to find for myself.

Suppose that little difficulty got over. I listen to them: they define my soul as my principle, the principle of my life and of my vital acts of thought and will. That is of no use to me till I know what *principle* is. They are very scrupulous logicians, and they proceed to inform me of that. First we have, copied, I am sure, from a page in which it stands as a sufficient, though very compendious, answer, "that which produces anything." The whole sentence is, paragraph 3—"If any one shall ask for a metaphysical definition of principle, I answer, it is (then inverted commas) 'that which produces anything.'" Well answered, say I; for it is a most metaphysical definition that will produce anything.

I break my unlucky shins first over the word "produces." The only use of the word, free from trope of rhetoric, is in geometry, when we produce a line. From a given point, in a given direction, we have a line to continue; that is the only notion of *producere* that is free from vagueness. We can talk correctly enough for common life, of the land producing crops, the sea producing fishes, the shopman producing his stock on hand, the manufacturer producing his wares and goods, the toothache producing pain, the frost producing chilblains,

the factor producing a product, the orator, the trumpet, or the bonnet producing a sensation, wealth producing idleness—and so on, I know not how far. You may call that running away with a subject. Why don't I stick to my text?

We read, "The idea of Principle (there is a capital P) is that out of which anything proceeds, as a tree from a root, or a stalk from a grain of wheat." "As a root to a tree, so a principle to its product." We are to ponder *proceed* and *product*; *proceeding* and being *produced*. The tree proceeds from the root, as part of an aggregate in space; the stalk proceeds from the grain, by a countless succession of changes in time. At any rate, seeing that the one point of production is the thing to consider, you cannot deny that the root produces the tree, and is therefore by definition its principle; nor that the grain produces the stalk, and is therefore by definition its principle. Very true; but the root produces the stalk as often as the root the tree: so by definition the stalk has two principles, the root and the grain. Further, as production is the one point to be studied, the stalk produces the grain as often as the grain produces the stalk, in the usual course of nature. So the grain is either product or principle, just as we please. And, in fact, the tree produces the root, just as much as the root produces the tree; for the sap digested by the tree in the sunbeams deposits every fibre both of tree and root. It is all beautifully circular.

If the scholastics were here, I should not have it all my own way. The debate about principle and product would last exactly a week, with more and more acute distinction on their part every hour. The end would infallibly be that the principle is verily that which produces anything; and that production—proper production—is that which is due to a true principle. And with that everybody would be satisfied, except a few captious people like you and me.

The most important feature in this specimen of metaphysics is the ring of scientific rigour in it. There can be no possible doubt about mathematical truth. Without paying any regard to my punctilious ignorance of what they are talking about, they proceed to clench all by an analogy of proportion. In old mathematical books the Rule-of-Three-statement, as A is to B so is C to D, or as A is to B so is C to the answer, is often called an analogy; and correctly, for analogy is the Greek for proportion. We have all heard of the analogies of Napier in spherics. Brinkley, in his *Astronomy*, always calls them analogies, and writes them as such, with the formal dots of the Rule of Three. It is laid down here: "As the root to the tree, so is the principle to the product." This is not offered explicitly as a truth of geometry or arithmetic; but it is an analogy or ratio of proportion, which, as we are informed, holds good. Well, if it be science in earnest, I may write it down on the black board thus:—R : T :: P : p; R over T equals big P over little p, which affirms neither more nor less than this, that R the root is to T the tree as big P the principle is to little p the product, the exact assertion before us.

Now, I myself am a case of the product. I—the-conscious-thinker am little p: I may put K for that: then we read that my sought metaphysical principle  $P_k$  is to me, Kirkman, as the root is to the tree. If this be a ratio of proportion, the unknown P ought to be got at easily in terms of the known realities—T, R, and K. K is plainly given, and as to the relation or ratio of R to T, we ought to be able to get that somehow out of a gooseberry tree. But they stop us there. We are not talking of your vulgar fractions, say they, we are talking metaphysics. The ratio of proportion in what cannot be counted is not numerical. Why, then, say I, do you condescend to employ the formula of vulgar arithmetic? What right have you to call your profundity about

Tree and Root, and Principle and Product, an analogy and ratio of proportion? They reply, If we choose to express our sublime truth in the form of an analogy of proportion, we can speak of it as such; for it is such, by its very form. Then they resolutely proceed to shut my mouth by this remark: "A root and a principle may be dissimilar in everything but the one point of production; yet the analogy or ratio of proportion holds good." Ugly customers are these old sages.

What can I do? I think I should beat a retreat under cover of this final illustration. Can you deny that 8 is the next to 2, in ascending proximity? No, they reply. Can you deny that 1878 is the next in ascending proximity to 1877? Of course not. Then I maintain that as 2 is to 3, so is 1877 to 1878. That is my analogy of proportion. They beg to test this analogy by the Rule of Three. I rejoin, I am not talking about the Rule of Three, nor of any other rule of arithmetic; I am talking only of ascending proximity, which, in itself, is a thing that cannot be halved, or doubled, or counted at all. I choose to write down my truth as an analogy of proportion, and I have a right to call it what it is by its very form. And, further, I maintain this thesis: a single figure and a row of figures may be dissimilar in everything but the one point of ascending proximity, yet the analogy or ratio of proportion holds good.

I have not come here to poke fun at metaphysics; but I defy any man to answer fine-spun logic like this, except by retorting it. You can never fairly retort truth so as to make it look like falsehood. I submit that it is of some importance that this, even if it be nonsense, should be answered, if we are in earnest about having, and affirming before all men, a fixed starting-point in the philosophy which we talk about ourselves, inasmuch as we have here before us the work of no trifler; we have here, in the best scientific

shape in which one of the foremost living scholastics in Europe can put it, the way in which those thinkers profess to begin, who loudly refuse to admit that Des Cartes made the right beginning. We can all grant that this ratio of proportion is a clever and ingenious attempt to escape from the fatal charge of *definition by metaphor*.

It seems to lay down more than what is intended. The scholastic writer means to affirm that the principle produces the product as really and truly as the root the tree. That makes the analogy ; in that there is nothing to amend. We are referred to the study of production of tree by root. But whatever our success may be there, I cannot see how I am to get at the real finite scientific principle of which I-the-thinker am the product. It is a useful common-place in logic, that a definition is of little or no use for a train of reasoned thought, so long as we have no proof of the existence of the thing defined. And the thing here defined is my finite metaphysical principle of life, thought, and will,—something different from this me-the-thinker, which is the product ; for my life, my thought, and my will is the product.

There may be sense in this analogy of root and tree, when once it is known or granted that this finite principle P of me-the-thinker exists. But until I am satisfied of its real existence within the reach of my faculties, I will not go one step with you in search of analogies to explain my dependence on this P. I say to these doctors, Place me in a real relation, of which I can see that I-the-thinker am one term, and this finite principle is the other. Thus only can I get at this P. Your philosophy begins with the unproved assumption that this P exists within reach of my science ; and it begins nowhere else. It is not presented as philosophy without assumptions ; and if it is not that, I say it is sham philosophy, in spite of angelic doctors. This is worth saying, if it be true ; and if it be not true, the error is

important enough to deserve confutation, unless all philosophy be alike a sham.

When we ask, What is the precise question which these scholastics are trying to answer, we obtain from what is before us the reply—Nothing but this, What is the principle of man's thought, life, and will? This becomes, when principle is explained, What is that which produces my life, thought, and will? or, What is that something in science which contains the reason why I am a living soul endowed with thought and will?

Here you are ready to remark, They mean the proper efficient cause—the cause which really produces the thing, and is the complete reason why. The answer to their question is, The cause “who worketh all in all,” the Creator and Preserver of all. You are greatly mistaken as to their meaning, if you think so. This *principium* is not The Great First Cause. It is something finite which contains the reason why, *quod rationem continet cur illud sit ejus dicitur principium*. I am afraid that *continet* is but a trope. Of the causation due to the Author of the Universe they say the noblest things, and think as we do. They repeat it again and again, that if the creating and preserving energy of that First Cause were suspended for a moment, the cosmos would fall back into nothing. You cannot offend these philosophers more than by telling them that they are pondering the impenetrable secret of the Divine Causation, when they are spinning their metaphysics; and you are lucky if they do not throw at your head that ugly missile, Pantheism, which they all maintain—and I suspect they are in the right there—to be merely a fine name for Atheism. A wonderful array have they to shew you of causes and causations. I have at home a *Lexicon Peripateticum*, a dictionary of scholastic distinctiones et effata. Under CAUSA I find, all in capital letters in full, the following:—Causa externa; Causa

interna ; C. finalis ; C. efficiens ; C. exemplaris ; C. formalis ; C. ex qua ; C. in qua ; C. circa quam ; C. prima ; C. secunda ; C. princeps ; C. instrumentaria ; C. univoca ; C. equivoca ; C. necessaria ; C. libera ; C. universalis ; C. particularis ; C. physica ; C. moralis ; C. adæquata ; C. inadæquata ; C. proxima ; C. remota ; C. per se ; C. per accidens. Under every one of these heads, and more, if you like, they will write you a long and most logical treatise, that will do you such a world of good.

Their causing *principium* of me and you is a fact which finite science can handle in definitions and demonstrations. It is something on this side of theology, but on the other side of nature, life and consciousness ; on the other side of what science can find in the field open to observation, experiment and memory. This latter is a very humble field, mere physics and psychology. Their sublime field is  $\mu\epsilon\rho\alpha\tau\alpha\varphi\sigma\chi\alpha$  ; it is on the farther side of physics ; it is metaphysics, and a long way on this side of theology. They seem to think that nothing can save us from Pantheism but their big buffer of metaphysics between physics and theology.

I confess that I have not to go far to find myself in theology. And most of us, when we get outside the known facts of time, space, force, life and consciousness, soon lose ourselves in the unsearchable, and begin to talk in tones of wonder and awe about the Infinite Cause of all. Not so the scholastics. There they are in their own domain, in comparison of whose permanent and grand realities the phenomenal field of physiologists, chemists, astronomers, and the like, is but an ever-fleeting sequence of accidental shadows. Theirs is the domain of being *per se*, the root and ground of all that firmly and really is to men or to angels ; and it is filled with potentialities, causations, actualities and principles like this which we are studying, to be got at only by penetrating right through to the other side ; filled, too, with

no end of wonders about ideas, entities, essences, receptivities, activities, substances in the sense of substratum, inherences and substantial forms. Marvels to behold are their tomes. I suppose that three hundred years ago the volumes of the scholastic philosophy exceeded in number those of law, letters, and all the sciences, if we except theology and what went for history.

It is not without reason that all our literature for centuries has been strewn with disdainful and resentful allusions to this imperial and tyrannical old science. Of course nothing ever goes far enough in this little planet, unless it goes too far. The panic, I hope, has reached its limit. The air is now musical with the voices of men brain-smitten, either from experience or from heredity, with a terror of that old horse Scholasticism and of his bold rider Sacerdotalism; men who are prophesying, some with more or less reserve, and others with no reserve at all, this venerable strain—that there exist neither Gods nor God, except Matter and his mother Must-be. These are the gentlemen described in the parable, who have jumped into the bramble-bush, and scratched out both their eyes. Before long, they will see that their eyes are out; then taking courage, and resolutely working towards their feeble and unfinished scepticism to a logical end, they will leap into the quickset-hedge, and scratch them in again.

Some may remark that it is but slaying the slain, to expose the pretensions of this old philosophy to search the unsearchable. I am in doubt whether one scholar in ten millions believes it, besides the Professors in Roman Catholic Colleges, and the confiding young men whom they train with such skill and mastery. If I may judge from what I read in the manuals written by those professors, they do not all quite believe it themselves.

They are yet a power in the world, those Roman Catholic Doctors and their pupils, and a power, I believe, for future

good. Fortunately, they are not bound to think it sinful to exercise their own judgment on the philosophy which the competent among them are so well taught. The future good will arise when a greater proportion of them have used their liberty of speculation. Let their school-philosophy be only well aired in public, and the rents and moth-holes in it well shown up, and there will remain very little that is perilous about those young gentlemen. They only laugh at those who attack them with texts. They are taught, if they have the capacity for it, to use their brains in matters of philosophy with a dialectic precision and readiness, with an all-roundness of research, and with a power of refined abstraction, in handling the difficult cobwebs of their schools, such as are, so far as I can discover, utterly unknown in our Protestant lecture-halls and manuals of clerical training.

This assertion should not be made here without some proof. Let one proof suffice, of which you will all judge. How many Protestant clergymen are there, conformists or nonconformists, who know anything about the philosophy of Boscovich? Are there three in a hundred of them who, when they came to be ordained, had ever even heard his name? In all my training in letters, science and theology, I never heard it. Now no Roman Catholic candidate for orders can go, as a student of ordinary industry, through a manual of their philosophy, or hear a single course of lectures on it, without learning something definite on the notions of Boscovich. No doubt they can forget what they learn as fast as our worthy selves. Not faster, I am sure. I do not believe that there are two dozen Protestant divines in all Lancashire who, if ever this Paper comes before them in print, will have the faintest appetite for its perusal. Their philosophical innocence will be fortunate if it escapes a convulsion at the title.

Scholastic philosophy is not all metaphysics. Far from it. It is in some departments an arsenal of the noblest logic

and truth. Notwithstanding what I have said against the mere metaphysics of it, I should like to be permitted here, without any pretence to play the prophet, for I may be quite in error, to place on record my persuasion—on which, however, I implore you to say not a word in the discussion that may follow, because it can lead to nothing, and can do no good—my personal persuasion, Broad Churchman as I am, that whenever the grand movement comes that shall uplift the Church of the future to the full reconciliation of Faith, Philosophy, and Science, it will come, not from our matter-and-must-be doctors and vivisectors, nor from our scandalous and wrangling sectarianisms, whether fat or lean, but from some liberal Pope and his Professors. I say that there lies hid, exactly where it ought to lie, a skilful flexibility and a scientific power of adaptation, which can yet bring about all that. But again I beg you to let it pass.

I could have despatched the whole of this matter, if my object had not been to give a lesson to younger men in philosophy, and to invite the attention of more good heads to these enquiries, in one word, metaphor, which some of you have probably noted. If the relation of proportion of this real principle to its product is in science that of root to tree, then, if we may think at all, we must logically infer that, as the root is verily the root of the tree, so the principle is verily the root of the product; as also that the root is verily the principle of the tree. If not, where is the sameness of the relation? Thus my unknown metaphysical principle is defined to me as the root of me-the-thinker, and that is all the definition that the analogy supplies. Principle is defined by *root*. My principle is simply my root. This is definition by a metaphor; and, in fact, this word *radix* is almost as often in the mouths of these philosophers as are their everlasting

tropes, *substare* and *substantia*. Our champion confesses the metaphor. I think I should have left that to be found out by my opponent. His words are conscientiously copied from his authorities, "and the word principle is not a metaphor of similitude, but of proportion." The ancient scholastic who invented that neat distinction was satisfied that there was something so highly scientific in the term *proportion* as quite to neutralise the mischief of *metaphor*. But as the proportion turns out to be not measurable proportion, admitting of less and more, which is the only kind known to any science, it is but trope upon trope after all.

If a definition by a metaphor be presented to me as an instrument of science, I shall put it in the fire, even if an angel has written it. This may be called captious; but if the builders of our glorious mathematics of motion had not been a hundred times more captious word-whippers and punctilious hair-splitters than I am, we should never have had a true astronomy. Why should it be impossible to agree about a rigorously exact beginning of philosophy?

I have entitled this Paper "The First Definition of the Scholastic Philosophy." I am not sure that it is not a misnomer. In none of their books have I been able to find an answer to my question, Where is the defined starting-point, or what is the fundamental proposition, or simplest combination of such propositions? But as I am most nearly concerned with what they have to teach me about myself, and most likely to understand their first lesson to me about me-the-thinker, I shall continue to affirm, until some one better informed takes the trouble to answer my question more correctly, that I have been here handling the first definition of their philosophy. If any one maintains that they have no first, or that there needs be no first, that man bears witness that their logic is all circular, and therefore

all vicious, logic. Most thankful shall I be to sit and listen to any one who can instruct me. There ought to come more light from somewhere in this Great Britain. Can no little circle of Englishmen exchange thoughts in earnest on these topics except in one room in one city—London? Why should not we, in this second city of the empire, have a Prophysical Section of our Literary and Philosophical Society?

DEPARTMENT OF THE INTERIOR  
U. S. Geological and Geographical Survey  
F. V. Hayden U. S. Geologist in Charge

PRELIMINARY MAP

SOUTH WESTERN

and parts of the

ADJACENT TERRITORIES

Showing the Location

ANCIENT RUINS

Geo. E. Chittenden, Topog.

High Sandstone  
Ancient Village  
Plains and  
Canyon Ditching  
Cactus

U T A H

Broad Valley

and alluvium

Barren Sandstone

Plains and  
Canyon Ditching

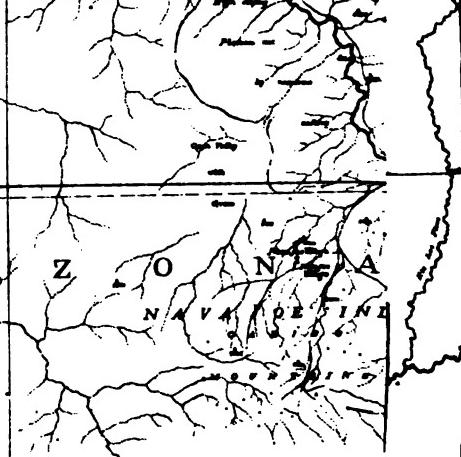
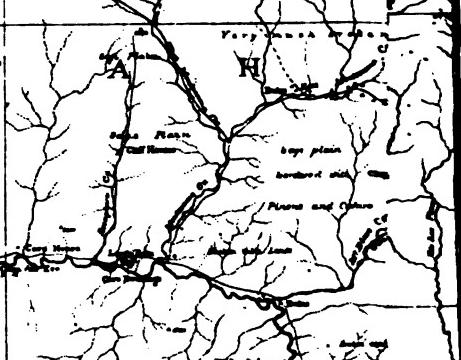
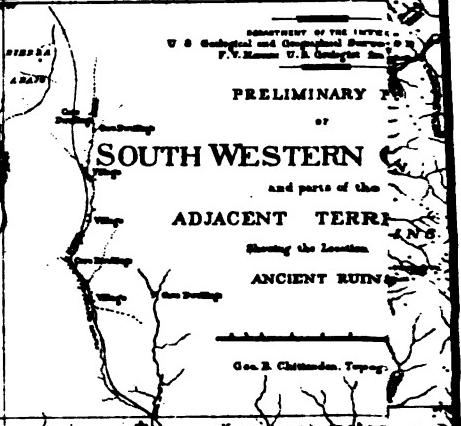
Cactus

Diamond Fields  
Diamond Mine

Barren Sandstone

Plains and  
Canyon Ditching

Cactus



Navy  
RN  
ERR  
ATN

## ON THE CLIFF-HOUSES AND ANTIQUITIES OF SOUTH-WESTERN COLORADO AND NEW MEXICO.

By ALFRED MORGAN.

ON a previous occasion, I had the pleasure of sketching, though very briefly, the history and progress of the United States' Geological and Geographical Survey of the Territories; and I propose this evening giving the Society a short account of the remarkable archaeological discoveries that have been made under the auspices of this Survey, in a region that was but little known until 1874, when one of Dr. Hayden's surveying parties, under the direction of Mr. W. H. Jackson, made a tour into the south-western portion of Colorado, for the purpose of examining and obtaining photographs of the interesting ruins of the dwellings of a long-forgotten race, which are very numerous in that region. By the kindness of Dr. Hayden, I am able to illustrate this Paper with a series of photographs which will bring the peculiarities of the structures to which I shall refer vividly before you. Mr. Jackson's narrative, which is contained in the volume of the *Annual Report* of the Survey for that year, is of very great interest, and awakened a lively curiosity as to the builders of the houses he described. In 1875, a special *Bulletin* was published by the Survey, containing papers by Messrs. W. H. Holmes, W. H. Jackson, and E. A. Barber, on the archaeology and antiquities of the region, and by Dr. Bessels, on the anthropology, etc., with other notes. It is to these publications that I am indebted for the information that I wish to bring before the Society this evening.

Mr. Jackson's explorations were made along the course of the Rio Mancos, one of the western tributaries of the San Juan, which originates in two forks flowing from among the western foot-hills of the La Plata Mountains. The Rio Mancos, from the junction of these streams, flows in a south-westerly direction, through fertile and beautiful valleys, to a plateau which is known as the Mesa Verde, through which it has cut a remarkable cañon. The Mesa Verde is a somewhat irregular table-land, comprising an area of about seven hundred square miles, and is formed by a great series of nearly horizontal sedimentary strata, of which the surrounding country has been denuded. This series of strata consists in the upper part of massive sandstones, in the middle portion of alternating sandstones and shales, and in the lower division of eight hundred feet or more of shales, clays, etc. These softer beds are, when once exposed to erosive agencies, carried away with great rapidity, and, as a consequence, the firmer rocks are undermined and break away, leaving vertical cliffs; and, where soft and hard beds alternate, a series of benches or terraces, with intervening slopes, is formed. A cañon formed under these conditions will consist of a narrow, irregular river-bottom, long, steep slopes of *débris* rising like the arms of a letter V from this, then a succession of steeps and slopes, culminating above in cliffs. The cañon of the Rio Mancos is nearly thirty miles in length, and ranges from one to two thousand feet in depth. It seems to have been a favourite resort of the cliff-building people, and traces of their occupation are found everywhere—along the river-course, in the cliffs, and on the plateau above.

Mr. Jackson thus describes the discovery of one of the most remarkable cliff-houses of the Rio Mancos:—"Our camp for the night was among the stunted piñons and cedars immediately at the foot of the escarpment of the

Mesa, its steep slopes and perpendicular faces rising nearly one thousand feet above us. Quantities of broken pottery were strewed across the trail to the edge of the stream, and, as ruins of some sort generally followed, close attention was paid to the surroundings; but with the exception of a small square inclosure, indicating possibly a grave, nothing was found to reward our search. Just as the sun was sinking behind the western walls of the cañon, one of the party descried, far up the cliff, what appeared to be a house, with a square wall, and apertures indicating two storeys, but so far up that only the very sharpest eyes could define anything satisfactorily. We had no field-glass with the party, and to this fact is probably due the failure to detect others during the day, for there is no doubt that ruins exist throughout the entire length of the cañon, far above, and out of the way of ordinary observation. Cedars and pines also grow thickly along the ledges upon which the houses are built, hiding completely anything behind them. All that we did find were built of the same materials as the cliffs themselves, with but few, and then only the smallest, apertures towards the cañon; the surface being dressed very smoothly, and showing no lines of masonry, it was only on the very closest inspection that the house could be separated from the cliff.

"The discovery of this house, so far above anything heretofore seen, inspired us immediately with the ambition to scale the heights and explore it, although night was drawing on fast, and darkness would probably overtake us among the precipices, with a chance of being detained there all night. All hands started up, but only two persevered to the end. The first five hundred feet of ascent were over a long, steep slope of *débris*, overgrown with cedar; then came alternate perpendiculars and slopes. Immediately below the house was a nearly perpendicular face of one hundred feet, that puzzled us for awhile, and which we were only able to

surmount by finding cracks and crevices into which fingers and toes could be inserted. From the little ledges occasionally found, and by stepping upon each other's shoulders, and grasping tufts of *yucca*, one would draw himself up to another shelf, and then, by letting down a stick of cedar, or a hand, would assist the other. Soon we reached a slope, smooth and steep, in which there had been cut a series of steps, now weathered away into a series of undulating hummocks, by which it was easy to ascend, and without them almost an impossibility. Another short steep slope, and we were under the ledge upon which the house was built. It was getting quite dark, so we delayed no longer than to assure ourselves that it was all we hoped for, and to prospect a way up when we should return the next morning with our photographic outfit."\*

This house, which is represented in Plate I., stands upon a narrow ledge, and is overhung by the massive strata which form the upper portion of the escarpment. The ledge is about ten feet in width, and of some twenty feet in length. The height of the overhanging strata, from the surface of the ledge or terrace, is about fifteen feet. Perched up in its little crevice, like a swallow's nest, the house consists of two storeys, having a total height of twelve feet, and leaving a space of two or three feet between the top of the walls and the roofing rock. Whether any other roof had ever existed, the explorers could not determine. The ground plan showed a front room about six feet by nine feet in dimensions, and at the back of it two smaller rooms, the face of the rock forming their back walls. These apartments were each about five feet by seven feet, and the room at the left-hand side projects beyond the wall of the front one. Remains of cedar beams were found, which had formerly divided the structure into two storeys. The lower front room has two

\* *Report U. S. Geol. and Geog. Survey*, for 1874, p. 872.

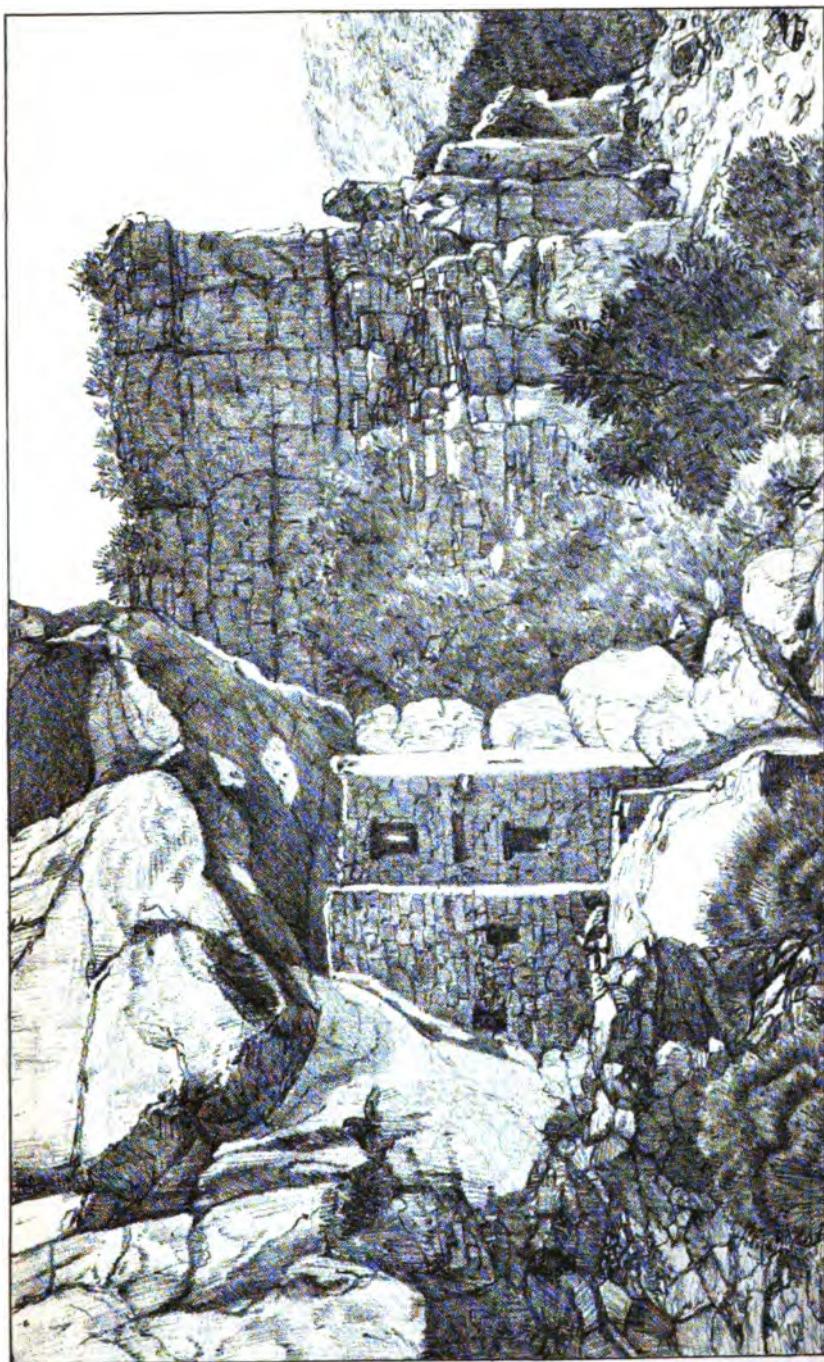


PLATE I.



apertures, one opening on the elevated esplanade, and serving as a door, though only measuring twenty by thirty inches, and the other, a very small outlook near the ceiling, which would command a view of the cañon below. In the upper storey is a window similarly situated to the door, and of like size and shape. The upper lintel of this window was formed of small cedar beams.

The entire construction of this little human eyrie displays wonderful perseverance, ingenuity, and some taste. Perpendiculars and angles are carefully regarded. About the corners of the windows great care has been taken; the mortar is compact and hard, resembling lime, but cracking all over. All the apertures are small, resembling the door already described. The walls of both the upper and the lower front rooms were plastered with an adobe cement of about an eighth of an inch in thickness, and coloured a deep maroon-red, with a white band eight inches wide running around floor, sides, and ceiling. Remains of similar houses were found in all directions, and there is little doubt that a large population once lived upon these ledges of rock.

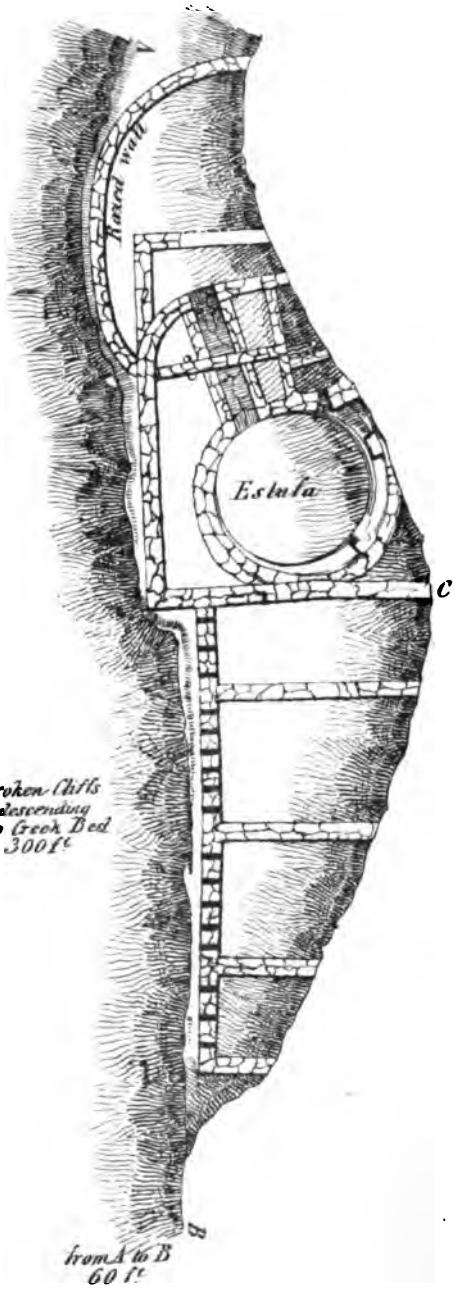
Numerous side cañons ramify in all directions into the Mesa, and along these come great freshets during the rainy season, producing deep "arroyos," and strewing the surface with the *débris* of rocks, cedar, sage-bush, and cacti. Mr. Jackson, speaking of this phenomenon, says:—"About the mouth of Coal-cañon the whole surface of the 'wash' was covered with lumps of fine-looking bituminous coal, as though a thousand coal-carts had traversed the district with their tail-boards out."

Mr. Jackson's party then traversed the Mesa in an easterly direction till they arrived at Aztec springs, near the El Late Mountains; but finding no water there, were not able to stay to examine in detail the massive ruins in the vicinity. The *débris* of these forms a great mound which,

though overgrown with artemisia, still indicates the original rectangular plan of the structure, with its circular inclosure in the centre. These ruins were again visited in 1875 by Mr. Holmes and his party, and are very fully described by him in the *Bulletin* of the Survey.

Plate II. is the ground plan of one of the most interesting of the Rio Mancos cliff-houses. The line from *a* to *b* is the front or precipice line of the niche-floor. From this the broken cliffs and slopes reach down to the river. The deepest portion of the recess is at *c*; and the dividing walls are all built to the rock. The most remarkable feature is the round room, or *estufa*, which, as is generally the case, is in a large rectangular apartment. This singular chamber had, without doubt, been constructed for a very special purpose. As Mr. Holmes remarks:—"The superstitions of the builders seem to have been so exacting in this matter, that even when driven to the extremity of building and dwelling in the midst of these desolate cliffs, an inclosure of this form could not be dispensed with; a circular *estufa* had to be constructed at whatever cost of labour or convenience." The entrance at *d* was so constructed that a person entering this inclosure would have to crawl through a tube-like passage of nearly twenty feet in length, and only twenty-two inches high by thirty inches in width. All this attests the desire of the builders to render the *estufa* as sacred as possible, and to guard against the possibility of intrusion. The other apartments do not require any special mention; they were quite plain and empty, and in passing from one room to another, the inhabitants had to climb up and over the walls and pass through apertures near the ceiling, the walls apparently having not been built up to the over-hanging rock.

The entire district in which the ruins are found is of about six thousand square miles in extent, and lies chiefly in the territory of Colorado, but includes portions of the



from A to B  
60 ft

Broken cliffs  
descending  
to Geoh Bed  
300ft



contiguous territories of New Mexico, Utah, and Arizona. The entire region is on the Pacific slope, and is included in the great drainage system of the Rio San Juan—a tributary of the Colorado of the West. The surface geology is chiefly cretaceous, and is cut up in all directions by deep and rugged canons.

A reference to the map which accompanies this Paper, and which is a photographic reduction of that issued by the Survey, will show that the country consists of a great plateau-region, and extends in a westerly and southerly direction from the base of the San Juan Mountains. Numerous streams, having their sources in the western slope of the Rocky Mountains, have cut their way, forming long canonized valleys through the nearly horizontal strata. In the greater part of the region there is little moisture apart from the streams, and, as a consequence, vegetation is very sparse, and the general aspect of the country is semi-desert. Yet there is abundant evidence that it at one time supported a numerous population; and there is scarcely a square mile in the six thousand miles of territory examined that does not furnish evidence of occupation by a race in every way superior to the nomadic savages who now roam over the country.

It has been thought that climatic conditions have altered since the date of this ancient occupation, for the dry and barren condition of the country, as it at present exists, would render it incapable of supporting even a moderate population. But, without discussing whether any such change has occurred, it is to be noticed that the majority of the ruins occur in the immediate vicinity of streams which yield a plentiful supply of water at all seasons.

All along the stream courses there are grass-covered meadows and alluvial soils, affording a large area of rich tillable land.

Most of the ruins are stone structures, but there is

evidence of other material having been used in the construction of the villages, etc., in the lower lying parts of the region. The remains may be classed under three heads:—

1. Lowland or agricultural settlements.
2. Cave dwellings.
3. Cliff-houses or fortresses.

Those dwellings that are comprised within the first group are usually found on fertile spots, and would appear to have been built with reference to convenience of water supply, etc., and not with a view to defence.

Those constituting the second class are built in excavations in the low bluffs of the middle cretaceous shales of the district, and with a view to security in case of attack.

The cliff-houses, the third group of structure, were intended to be places of secure refuge and defence, and were built in the most inaccessible places; and—unless we may suppose that some water may, at that period, have found its way from the level of the surface of the plateau in descending streams, and have been utilised by the dwellers in their elevated habitations—were far removed from the source of water supply.

The lowland ruins are the remains of such agricultural settlements as would be built by any peaceful and unmolested people. The cave-dwellings may not have been the usual dwelling-places of the people, but were used on these occasions when it was necessary to be on guard against invasion. The cliff-houses would serve as the last resort of a desperate people, who were determined to hold to the very last, and we can readily imagine that such fortress-dwellings would enable the invaded families to defy for a considerable time the attacking forces that assembled below them.

In form, the parallelogram and circle predominate, and a considerable degree of architectural skill is displayed. Where the conformation of the ground permits, the squares are

perfect squares, and the circles are perfect circles. A great part of the ordinary structures are square, while attached to each group, and sometimes without indications of contiguous buildings, are circular structures, resembling towers. These are the most pretentious edifices, being sometimes as much as forty feet in diameter, and in many cases having double or triple walls. They are solidly built of hewn stone, dressed on the outside to the curve, neatly jointed and laid in mortar.

The space between the outer walls is invariably divided by heavy partition-walls into a number of apartments, while a circular depression, or *estufa*, occupies the centre of the inclosure. *Estufa* is a Spanish word, and signifies "sweat-house" or "council-house."

It seems evident from the extraordinary forms of the towers that they were not intended to be either dwellings or defensive structures; and they are generally regarded as the edifices in which the religious observances of the people were conducted. If, as is generally supposed, the ancient races of these regions worshipped the sun—the eternal fire—the circle may be taken to symbolise their deity. And the occurrence of one or more of these circular inclosures in every settlement would seem to be at once explained.

But it is more difficult to explain the significance of the double and triple walls with the numerous compartments between. In the inhabited Pueblos of to-day, there are underground rooms, mostly circular, used as council-chambers, and also for the celebration of the mysterious rites of their religion. Lieutenant Simpson describes such chambers as being common in all the ruined cities of New Mexico.\*

It is stated by Squier and Davis, in *Ancient Monuments of the Mississippi Valley*, that in Mexico the sacred

\* *Journal Amer. Geographical Society*, vol. v., etc.

inclosures were used for defensive purposes when necessary, and it certainly seems probable that these curious structures served the double purposes of temples and fortresses, and the intermural apartments were, perhaps, the cells of the priests, or the chambers in which sacred or valuable property was placed for security.

The smaller single-walled towers which are scattered at intervals along the cañons were probably watch-towers. The cave dwellings were made by digging irregular cavities in the faces of the bluffs or cliffs of friable rock, and then walling up the front, leaving only a small doorway and an occasional window. The cliff-houses conform in shape to the floor of the niche or shelf on which they are built, and the manner in which they are attached to the cliffs is truly marvellous. Their construction has cost an immense amount of labour, all the stone and mortar of which they are built having been brought for hundreds of feet up most precipitous places. In general aspect they present a more modern appearance than do the valley or cave remains, and may, perhaps, be regarded as the monuments of the closing period of a long era of occupation.

Of works of art, other than architectural, that might assist in elucidating the history of the singular people who dwelt in these regions, but meagre discoveries have been made, though it is probable that future explorations will be fully rewarded. A small number of arrow-heads, stone implements, ornaments, and articles of fictile manufacture, that may be fairly regarded as the work of the builders, have been collected. There is no evidence whatever that metals were used. The remains of pottery are very abundant, and would seem to indicate that the ancient tribes of the San Juan produced fictile fabrics superior to those of the town-building tribes of the present day. There is, however, great similarity between the modern and the ancient work, both in

material and execution, and the difference observed is only what might be expected as the result of centuries of degeneration. Mr. Holmes found fragments of bowls, cups, jugs, pitchers, urns, and vases, in wonderful profusion and almost infinite variety. The material used is generally a fine clay, tempered with sand or pulverised shells. The modelling was done with the hand, and no implement whatever appears to have been used except for the production of surface markings, &c. ; the thickness of the ware varies from one-eighth to half an inch. Most of the pottery found has been baked and glazed.

These shattered remains of fictile art that are so abundant in all parts of the region are of great interest, as they indicate that the wonderful people who fashioned them had attained to a high degree of artistic culture. That they inhabited the country at a period antecedent to the date of the Spanish Conquest is all that can be positively affirmed of them, and the question whether they had come within the influence of European civilisation cannot yet be answered.

The most striking peculiarity of the pottery is the regular and hard glazing. In some instances it is rather opaque, whitish, and covers the surface in a thick layer; while in others it is perfectly transparent. The colouring matter used in the production of the patterns was, perhaps, charcoal, but no accurate analysis has yet been made.

Dr. Emil Bessels, from his examination of the skulls and bones brought from these ruins, concludes that it was the practice of these ancient people to compress the skulls of their children in infancy, and makes some very interesting remarks on the subject. He infers that if such deformations are practised, there is always a guiding idea, either emanating from æsthetical feelings, or with some practical

purpose. For instance, among the ancient Peruvians the flattened skulls were considered a sign of aristocracy and high breeding; while, in other cases, the skulls of children have been deformed in early life in order to produce a straight line of profile.

"That the idea of the beautiful was developed to an uncommon extent among the inhabitants of the ruins, is attested by the fact that the fragments of pottery found show simple but tasteful ornamentation, and that great regularity prevails in the construction of their buildings, and that other portions of their handiwork would gratify our own æsthetical feelings."\*

As symmetry prevails in all their work, it is only natural to suppose that the love of it led to the practice of deformation of the crania of their children. Wherever this is the custom, the mother of the child performs the operation with the utmost care, in order to produce the conventional shape, and on one occasion, when Dr. Bessels examined about two hundred flat heads, he found very few that were unsymmetrical. It would appear that the people were in the habit of strapping their children against cradle-boards, as a great many modern Indians do, and hence resulted the flattening of the occiput.

Major Powell remarks that the different Indian tribes he is familiar with keep their children strapped to the cradle-board for one and a half to two years.

Numerous hieroglyphics were observed, both engraved and painted, on the cliffs. A great number of burial-places were noted, which, generally overgrown by pinons and cedars, usually occupy the summits of high ridges and promontories, and are still marked by slabs of sandstone, set on edge and arranged in circles and parallelograms. But that it was not the invariable custom to bury the dead in such localities is

\* Dr. Emil Bessels, *Bulletin*, Vol. 2 p. 60.

proved by the frequent discovery of human remains in the arroyos, or deep washes of the valleys.

The question—May any one of the existing tribes of Indians be regarded as the lineal descendants of the ancient people whose work we have been discussing? would seem to admit of an affirmative answer. And the present Pueblos are thought to be the direct descendants of the ancient inhabitants of Southern Colorado and New Mexico, although there are no very definite traditions existing among them that this is so. The conclusion is arrived at from the fact that the mode of constructing houses practised by the Pueblos does not differ materially from that of our ancient architects. The modifications that are observed are such as may readily be explained by the altered conditions of living and modern influence. The dome-like structures of the Peruvians and Eskimos are alone of their class in America.

Another evidence is afforded by the pottery of the Pueblos, all of which is fashioned in the same designs, except that the ancient ware is more carefully made and shows more artistic talent.

It has been thought that in the Moquis of Arizona we may recognise the descendants of these people, and the tribe cherish the tradition that they have descended from the builders of these interesting dwellings, but they retain scarcely a vestige of the civilisation which the remains attest to have existed, and it would seem most probable that in the Pueblos we see the children of the race, the record of whose existence had well nigh been obliterated. But, not to pursue this enquiry further; in the ruins, etc., we have a testimony of the existence of an ancient civilisation in America, and an indication of another centre from which its influence has radiated. We have had opened out before us a new field for anthropological enquiry and criticism, and

it is to be hoped that such investigation will ere long be energetically undertaken.

---

\* \* \* I present to the Society the Map and the Plates that accompany this Paper. The former has been photographically reduced from Mr. Chittenden's Map, and Plate I. was sketched by Mrs. Morgan from the Survey Photograph.

SKETCH OF THE ORIGIN AND PROGRESS OF THE  
UNITED STATES GEOLOGICAL AND GEOGRA-  
PHICAL SURVEY OF THE TERRITORIES.

By ALFRED MORGAN.

THE Survey, the operations of which I wish to bring before the notice of the Society this evening, has not yet completed the first decade of its existence ; but, during the short period in which it has pursued its investigations, it has accumulated, as the result of untiring energy and well-directed zeal, a rich fund of information, and has published reports, etc., which have awakened a deep interest, not only in the United States, but also in England and on the Continent of Europe. The excellent *Monographs* and other publications, so admirably printed and illustrated, and which are distributed on a scale of the most open-handed liberality to societies and institutions in all parts of the world, and to large numbers of scientific workers besides, form quite an *embarras des richesses*, from which it is difficult to select without invidiousness.

The Survey is under the direction of my esteemed correspondent, Professor F. V. Hayden, and may be said to have first taken form in 1867, when the territory of Nebraska was united to the Federal Union as a state. On that occasion Congress voted the sum of five thousand dollars, the unexpended balance of the legislative appropriation, for the purpose of a geological survey of the western portion of the new state, and requested Dr. Hayden to take charge of the expedition. In the following year a like sum was voted by Congress, and the work of the Survey was carried into Wyoming. In both these years the work was carried on under the auspices of the General Land Office, but in 1869 the Survey was placed

under the supervision of the Secretary of the Interior, and received its present form. It then commenced a reconnaissance of the Rocky Mountain region, and published much valuable information — geological, mineralogical, agricultural, etc. The Congressional grant was increased in 1869, and still further in 1870, when the area explored comprised a belt of country in Wyoming Territory, along the line of the Union Pacific Railroad. The Report for the latter year includes papers on the geology, natural history, meteorology, agriculture, and natural resources of the region. It has also special reports on palæontology, and presents, in a volume of five hundred and eleven pages, with woodcuts, etc, the first of the series of *Annual Reports* which have since then regularly appeared. The result of the work of the three previous years was published in a single volume.

In 1871 the explorations were carried on in the wonderland of the Continent. The Yellowstone country, with its lake and falls, its geysers and crystalline deposits, was surveyed. The results of this year's work were of the very widest interest, and descriptions were published in America and Europe. So great was the wonder and interest that was aroused, that in the next year's session of Congress it was enacted that the region that had been explored should be set apart as a "National Park" for the everlasting benefit and enjoyment of the people. The Report for the year contains five hundred and thirty-eight pages, with maps, plates, and figures, and is an exceedingly valuable contribution to geology, botany, zoology, and the kindred sciences.

In 1872, the corps of the Survey was divided into two parties, each provided with a geologist, topographer, meteorologist, naturalists, assistants, collectors, etc. The area of exploration for the one party was, as in 1871, about the headwaters of the Yellowstone, Gallatin, and Madison Rivers; and for the other division, the Snake River region.

It was discovered that the Teton Mountains were misplaced by so much as thirty miles distance in all existing maps of the country. The work of the year formed the basis of two geological maps, which I bring before your notice this evening. The Report for this year has eight hundred and forty-four pages, and, like the others of the series, contains many elaborate papers on special subjects. It is illustrated with nearly ninety plates, maps, sections, etc.

The Report for 1873 contains seven hundred and eighteen pages, and is devoted to Colorado. It is equal to the others in interest and value. Subsequent Reports have not yet reached England.

In 1871, Dr. Hayden began to carry on a geographical survey in association with a geological one, and it has been found eminently useful thus to bring the geologist and topographer to act in concert. Existing maps were so inaccurate that they were of little or no use. The system of topographical work until then pursued was that in general use in army surveys, *i.e.*, the reconnaissance of the line of march with the country in sight from it, controlled by courses and distances, arrived at by means of compass and odometer, with the supervising check of the sextant. In 1872 the system of control was improved by the addition of a running system of triangulation, which, in conjunction with the observations for latitude, were used in correcting the work. The character of the work done in these two years, embracing an area of eighteen thousand square miles in Wyoming, Idaho, and Montana, is among the best that has been accomplished.

In 1873, when the survey of Colorado was commenced, it was found necessary to inaugurate a system of primary triangulation, in order to fix a number of points with accuracy, which might serve as the basis of future topographical work. The first important step was to find a suitable surface for the accurate measurement of a base-line, and Mr.

Gardner ultimately selected a spot to the east of Denver, where a tangent of the Kansas Pacific Railroad possessed the requisite conditions. The base is a little over six miles long, and was measured with a steel tape of 100 feet in length, having a spring balance attached, by which the tape was stretched with a tension of sixteen pounds. The temperature was taken every five minutes, and the entire work was twice gone over. The base was levelled and duly corrected for irregularities and temperature. "All the angles of the triangles were repeatedly observed, and the quality of the work was determined by the test whether the three observed angles, when corrected for spherical excess, sum up to  $180^{\circ}$ . That by which they vary from  $180^{\circ}$  is an error. The mean error in the primary triangles of Colorado is only  $10\cdot3''$ . The angles are observed with an eight-inch circle, graduated to  $10''$  and reading easily to  $5''$ . The triangles are from thirty to seventy miles on a side, according to the nature of the ground. The trigonometric stations are situated some eight miles apart, on the most suitable altitudes. From these, other points are determined, and the topography carefully sketched, both with respect to its drainage, horizontal contour, and profile. From these surveys topographical maps are made, on a scale of two miles to an inch, shewing the form of the country in horizontal contour lines, two hundred feet apart in elevation. From these maps all the physical features of the country are easily deduced. The area covered was over twelve thousand square miles in extent."

In 1874 a second base was measured in St. Louis Valley, and an equally good expansion was made over an area of about ten thousand square miles. Connection is established with the work of the United States Coast Survey whenever it is possible.

U. S. GEOLOGICAL AND GEOGRAPHICAL SURVEY, ETC. 861

In 1875 and 1876 the work was extended so as to cover all Colorado west of the 105th meridian, besides small portions of New Mexico, Arizona, and Utah, in all about seventy thousand square miles.

In the history of the Survey just sketched there are three periods :—

The first comprehends the years 1867 and 1868, when the work consisted in the collection of geological facts and specimens.

The second extends from 1869 to 1872, when observations on the material resources and natural history of the areas surveyed received more careful and extended study.

The third period dates from 1873, and was marked by the thorough reorganisation of the Survey. The important relations of topography and geology were then recognised, and the work so arranged as to receive mutual benefit in each department. At the same time, observations continue to be made in all departments of natural history, archaeology, and the ethnology of the Indian tribes, etc.

The publications of the Survey consist of :—

*Annual Reports*, 8vo.

*Miscellaneous Publications*, 8vo.

*The Bulletin*, 8vo.

*Monographs*, 4to.

*Maps and Sections*.

(i.) The *Annual Reports* are written in a popular style, and contain excellent maps and illustrations. I have referred to them so fully that I need only call your attention to the series on the table.

(ii.) The *Miscellaneous Publications* consist of lists of elevations, catalogues, synopses, etc. The largest of the series is a volume entitled, *The Birds of the North-West*, by Dr. Elliot Coues, in which every known species is fully described.

(iii.) *The Bulletin* is designed to give immediate publicity to any remarkable discovery that it is thought desirable to make known before the ordinary *Reports* or *Monographs* appear. It forms an annual volume. Archaeology has a prominent place assigned to it, and the description of the ruins so abundant in the remarkable region of South-Western Colorado, etc., give a particular interest to this series of publications.

(iv.) The *Monographs* or *Quarto Reports* are very elaborate works, and treat of special subjects. Those that have appeared up to the present time are:—

*The Acrididae of North America*, by Professor Cyrus Thomas.

*The Extinct Vertebrata of the West*, by Professor Joseph Leidy.

*The Cretaceous Flora*, by Professor Lesquereux.

*The Cretaceous Vertebrata*, by Professor E. D. Cope.

*The Fossil Invertebrata of the Western Territories*, by F. B. Meek.

*The Geometrid Moths*, by A. S. Packard, jun.

In this magnificent quarto series of publications, in which the results of original and exhaustive research are embodied, it will be seen that natural history receives special attention. One of the volumes, Cyrus Thomas' "Revision of the *Acrididae*," is a valuable contribution to science in a country where insect pests are so destructive. Packard's splendid monograph of the Geometrid Moths, which constitute a very numerous family, has received the highest praise. The author thinks that one thousand species exist in North America alone.

Among the publications that are announced are the *Annual Reports*, in continuation of the series, and *Monographs on the Vertebrate Palæontology of the Eocene Formations of the West*, by E. D. Cope; *On the Vertebrate Palæontology of*

*the Miocene Formations of the West*, by E. D. Cope; *On the Fossil Flora of the Lignitic Tertiary Formations of the Western Territories*, by Leo Lesquereux; three volumes of contributions to the geology of Montana, Wyoming, etc., with woodcuts, sections, maps, and over a hundred photographs and plates; and on the fossil insects of North America.

Much discussion has taken place, and still continues, as to the true horizon of several important geological formations of the West. The eminent collaborateurs of the Survey are not by any means unanimous in the opinions they form. The difficulty of correlation with an European standard is one which may be expected to recur as geological and palæontological observations become more extended. The evolutional tide of organic development does not appear to have advanced at the same *rate* in all parts of the world, and in the West it would appear that a development of plant life was arrived at in a much earlier geological era than has been observed in Europe; while the development of vertebrate life characteristic of the European Cretaceous period was, on the American Continent, continued into the Tertiary age. In short, in the West, we find an actual comingling in the same strata of characteristic types of these two formations. We have thus true transitional strata which render it impossible to say where the line may be drawn between the Tertiary and the Cretaceous formations, and a great gap which has hitherto perplexed geologists may be regarded as having now been bridged across.

I hope, on a future occasion, to discuss some of the questions that have arisen out of the wonderful palæontological discoveries that have been made during the last seven years, discoveries for the most part the result of Dr. Hayden's Survey.

The aid of photography, which was first called into

requisition in 1870, has proved most valuable; and the series of photographs which I exhibit this evening will present to your view the principal physical features and characteristic scenery of the west with vivid accuracy.

The photographs illustrating the antiquities of the Southwest introduce a subject which I hope to bring forward on another evening.

In conclusion, I congratulate the Society on the latest addition, made on the recommendation of its Council, to the roll of its Honorary Members. Dr. Hayden has been for twenty-five years an active explorer, and is the presiding genius of a Survey which stands unequalled for the zeal and proficiency of its staff, and the enlightened spirit of its organisation. It is to be wished that the same liberal spirit was shewn by our own government in helping forward researches in natural science, and in placing the results of such surveys in the hands of all to whom they would be useful.

I bring my communication to a close by quoting Dr. Hayden's circular to correspondents, etc.:—

OFFICE U.S. GEOLOGICAL SURVEY OF THE  
TERRITORIES.

WASHINGTON, D.C.

The writer is desirous of securing by exchange or purchase the publications of foreign countries on Geology, Palæontology, and Natural History generally, to aid in the formation of a library of reference for the use of the Survey of which he has charge.

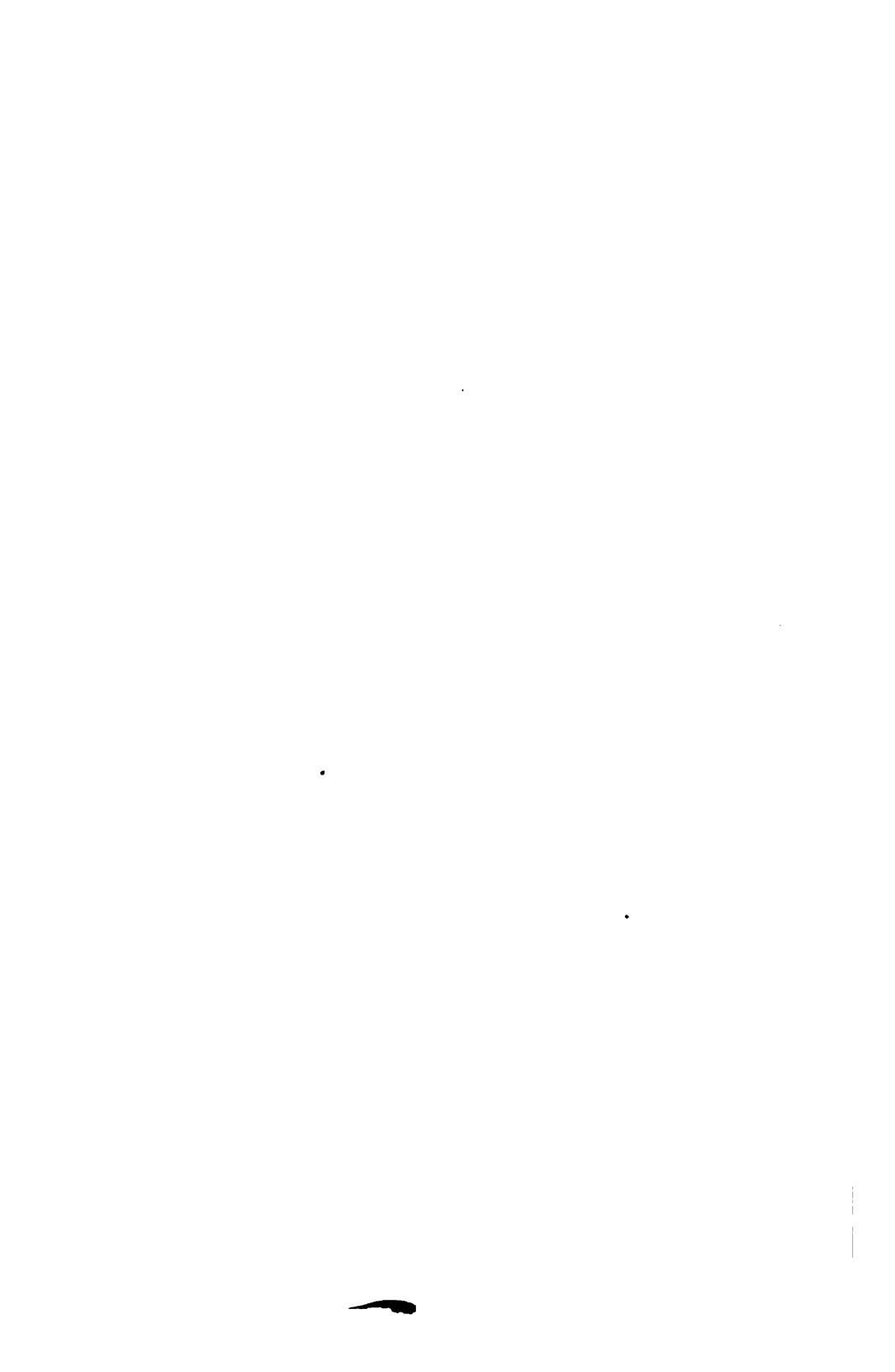
He takes this method of asking those persons or societies that may receive the publications of the Survey, to reciprocate by sending to him such of their own publications as they may feel disposed, and he believes that he can assure them an ample return, either in books or specimens, or both.

The reports of surveys, with maps, charts, and sections, transactions of societies, or the publications of individuals engaged in scientific studies, are much desired as works of reference.

**U. S. GEOLOGICAL AND GEOGRAPHICAL SURVEY, ETC. 365**

Parties who may look favorably upon the above proposition, can send all packages through the Smithsonian Institution, to the address of Dr. F. V. HADYEN, U.S. Geologist, Washington, D.C.

A careful record will be kept of the address of all the correspondents of the Survey. Societies, libraries, or persons failing to receive the publications of the Survey, will confer a favor by communicating the fact without delay.



## THE SILVER QUESTION.

By J. C. REDISH.

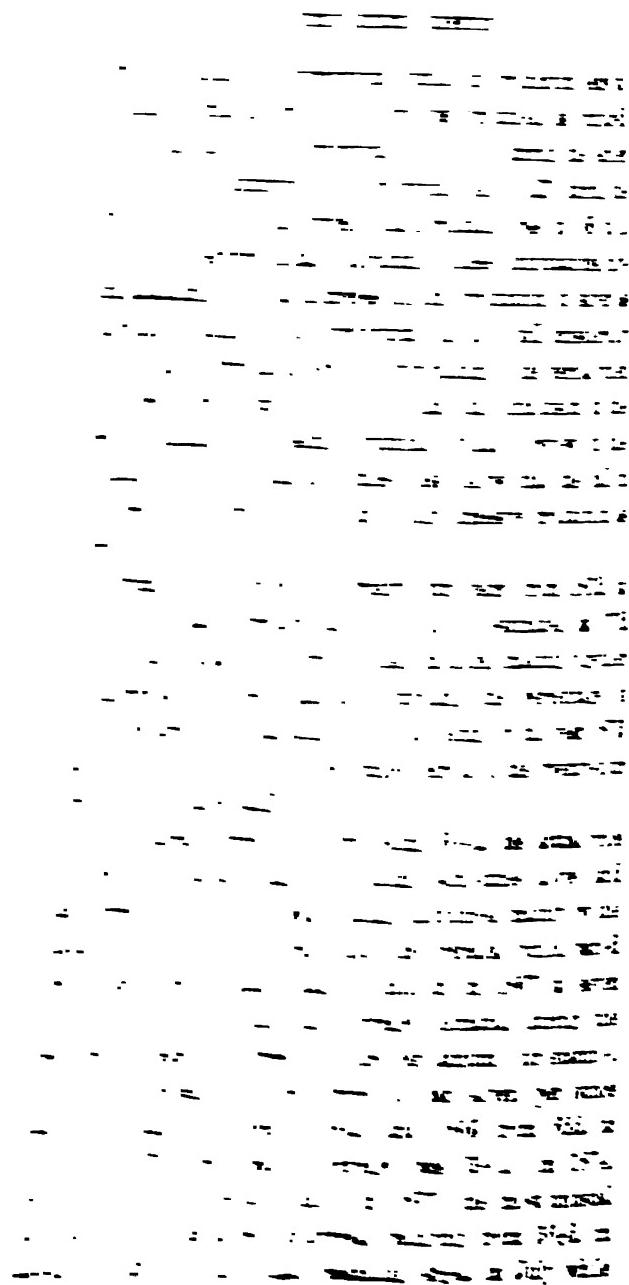
## I.

THE annual production of silver in the world prior to 1848 was estimated by the leading authorities at £8,720,000 per annum, and had varied slightly for many years, that production being found about adequate to supply the demand for coinage and manufacturing purposes ; and silver remained pretty stationary at par with gold, on the basis generally recognised of gold being worth fifteen and a half times its own weight of silver. This, on the English plan of coining gold into sovereigns at the rate of £3 17s. 10*½*d. per oz., gave as the normal price of silver, estimated in pounds sterling, a rate of 60*½*d. per oz.

For several years there was little change in the production of silver, though, in the meantime, the production of gold had largely increased, owing to the discoveries of that metal in California and Australia. The following table will show the production of the two metals from that period, and the changes in their respective proportions :—

Annual Average of five years.	Gold. Millions Sterling.	Silver. Millions Sterling.	Proportion of Silver to Gold.
1852-56	29.900	8.100	0.27 to 1
1857-61	24.600	8.200	0.38 " 1
1862-66	22.700	9.900	0.44 " 1
1867-71	23.600	10.600	0.41 " 1
1871-75	20.400	18.900	0.68 " 1

The production of silver for the year 1875 has been estimated at £16,000,000, or double what it was some twenty



sales, we believe, were subsequently effected for a short period at rates even below that figure, say at 47d. The price, however, afterwards rallied, and a reaction set in, causing an advance to about 58d. in January last, from which time, however, it has declined considerably, and is now at about 54d., with great uncertainty as regards its future rate.

## II.

The discovery of the silver mines in America, in the sixteenth century, caused silver to decline very seriously in its relation to gold, so much so that whilst, from 1560 to 1575, gold, according to the French Mint regulations, would purchase 11.17 to 11.44 times its own weight in silver, the value of the latter had so far declined, in 1640, that for its equivalent in gold 18.51 times its own weight had to be given; and, in 1665, it required 15.10 for the same purpose, according to the regulations of the same Mint. In our own day, on the other hand, the discoveries of gold in California and Australia caused a disturbance in their relative values in the other direction; and though the annual production of silver is double what it was a few years ago, there occurs a rise in the price corresponding in point of time with the increased production. These changes in the relative rates of production of the two metals were entirely unforeseen, and not the result of human arrangement, and we must therefore look in the future, as in the past, for a variation from time to time in the relative proportions of supply, and that, too in unknown and incalculable amounts, for "gold and silver, though the least variable in value of all commodities, are not invariable, and do not always vary simultaneously." (Mill).

Some few particulars regarding the past production of silver, and its proportionate value to gold, will be useful and instructive.

It is impossible to give, with confidence, any trustworthy statement of the production of silver in former times, but students of history have found sufficient references to the state of the coinage, and other points connected therewith, to enable them to calculate, to some extent, the relative values of the two metals at early and remote periods. The earliest relation subsisting between the metals seems to have been 1 : 13.83, which appears in ancient times, and for many centuries, to have suffered little variation ; this stability has been probably owing to the limited nature of commerce, and its control by the various governments. Herodotus, in his account of Indian tributes, B.C. 440, describes three hundred and sixty gold talents as being equal to four thousand six hundred and eighty silver talents, which would show a proportion of 1 to 13. In Greece, Egypt, and Italy, the value did not vary, as a rule, very far from the ancient rate, and in most cases such disturbances may be traced either to the sudden influx of gold from new quarters, or to the arbitrary action of governments for purposes of profit in coinage. During the reigns of the early Roman Emperors the rates varied from 11.97, under Augustus and Tiberius, to 14.40, according to the coinage of Constantine and his successors ; this latter rate, however, was probably only temporary, as during the reigns of most of these Emperors the silver coinage was debased, and hence the value of the precious metals, pure, was as 1 to 11, and even less.

During the Middle Ages, silver gradually rose in value for some centuries, until, about the year 1500, it was rated at 10.7 in Spain, by Isabella, being worth at the same time 10.5 in Germany. This was the average ratio in the commercial cities of Italy during the thirteenth century, and, being then exceptionally low, indicates a much greater supply of gold in that highly civilised region, at that time, than was available in the more warlike and less commercial parts of Europe ;

indeed, at that period the Italian cities of Milan, Florence, Lucca, Rome, and Naples were notably prosperous in trade and manufactures; and we may well believe that gold flowed in abundance to them, as to points where it could be safely and profitably invested. In the course of the fifteenth century there is no doubt the relative value of gold declined to about 10, and this is attributed to the scanty supply of silver, inadequate to meet the demands both of the silversmiths and of the traders to the East; the mines in the old world were nearly exhausted, and the treasures of the new world were, as yet, undiscovered.

This process did not continue for ever; disturbing causes soon occurred, and the relative value of silver gradually declined from 10.5, in 1500, to 15.10, in 1665, as already named; this result was caused by the large imports of silver into Europe from America, as well as the remarkable productiveness of the Bohemian and Saxon silver mines.

The annual supplies of the two metals is roughly estimated in the following table:—

		Gold.	Silver.
1550	..	£80,000	£520,000
1600	...	240,000	2,000,000
1650	...	460,000	8,000,000

The increased supply of gold came largely from the Guinea Coast and from Hungary, and the silver from Peru and Mexico; the production of silver being about seven times that of gold. Much of the silver found its way to the East Indies, enough, however, remaining to cause a fall in its relative value, an increased demand having set in for gold in consequence of the large war expenditure rendered necessary by the troubled state of Europe.

The following table shows the fluctuations in the ratio for upwards of a century and a half:—

Date.	Ratio.
1687-1700	14.97
1701-1720	15.21
1721-1740	15.08
1741-1790	14.74
1791-1800	15.42
1801-1810	15.61
1811-1820	15.51
1821-1830	15.80
1831-1840	15.67
1841-1850	15.83

Up to the beginning of this century the import of silver into Europe from America was continued and increased, being still chiefly required for the East, while from that quarter, in return, were received large quantities of gold; a most profitable transaction to the merchants in the trade, for while ten pounds of silver, bought in Europe and shipped to China or Japan, would exchange there for one pound of gold, this latter, on arrival in Europe, would exchange for fifteen pounds of silver; so no wonder the trade was well pushed, as it left a profit of no less than fifty per cent.

Between 1749 and 1761 there was a large supply of gold from Brazil, which caused a rise in the relative value of silver of four per cent.; from 1701 to 1748 the average ratio was 1 : 15.19; from 1751 to 1755 it was but 1 : 14.53, and the change would, no doubt, have gone on and become much greater but for the demand which then set in for gold, required by the United Kingdom for the purpose of coinage, and for the payment of heavy war subsidies to the continental nations during the struggle with Napoleon. Even whilst specie payments were suspended in England, the hoarding and the war subsidies kept up the price of gold, and a rise took place on the resumption of specie payments, the average for the year 1821 being 1 : 15.95; the demand for gold

being then greater than before, the value of silver in relation thereto fell, in obedience to the general law of supply and demand.

At the beginning of this century the average annual productions of gold and silver were estimated at £2,634,000 and £7,782,000 respectively, the values being in the proportions of 3 of silver to 1 of gold; from then till 1829 the respective values were £1,600,000 and £8,640,000, being in the proportion of 2.3 of silver to 1 of gold; and prior to the gold discoveries of 1848, the respective annual productions were £10,110,000 of gold to £8,720,000 of silver, showing that the production of silver was to gold as 0.86 to 1.

During the period under review, therefore, there had been a large absolute increase in the production of the metals considered jointly, but a much greater relative increase in the proportion of gold than silver. The natural tendency of this increased supply of one of the metals would have been to depress its relative value to the other; in other words, to lower its purchasing power, or command over commodities in general, including the other metal, which is equivalent to a rise in the value of silver, for all expression of value is relative, and a rise of one implies a fall in the other; this being simply the expression, in another form, of the same fact. In considering, however, the natural effect of an increased supply, political economists, for the sake of the pure abstract argument, assume, as a condition, that all other things—specially including demand—remain the same; now this is what seldom or never happens in fact, and discredit is often unjustly thrown on political reasoners from a supposed discrepancy with actual facts. The test of a theory is its power to explain phenomena, and these require to be examined in their entirety before we can say whether there be any countervailing tendencies working in an opposite direction. Now, in this case, such tendencies are clearly known. There

was a concurrence of political and commercial causes, all intensifying the demand for gold, so that the actual effect was, that the augmented gold supplies, so far from influencing the market prejudicially, were found only sufficient to keep pace with the demand; and we must always remember that it is not the absolute supply of a commodity which determines its value, but the relation which that supply bears, at any given moment, to the effective demand, so that price is the product which ascertains and indicates the equation, at the time existing, between supply and demand; the result in this case showing, in the year 1846, an average ratio of 1 : 15.66.

### III.

Before proceeding to examine the proportionate relative value of silver to gold from the year 1848, it will be necessary to inquire somewhat into the causes which were in operation, other than those of natural laws, having for their object the maintenance of perfect equilibrium between the two metals. France, in the year 1803, had adopted for herself the bi-metallic system, under which she coined both metals in the fixed proportion of  $15\frac{1}{2}$  to 1, making either of them legal tender, at the option of the debtor, both in respect of public obligations and of private debts. The silver five-franc piece contains 347.25 grains of silver, and is of the full value which it represents, differing therein from the coins of lower denomination in that country, as well as from the English silver coinage, which is of nominal value only, being debased by the admixture of  $12\frac{1}{2}$  per cent. of alloy, so that if melted there would result a loss to the operator to that extent, corresponding with the equivalent profit to the Mint on coinage. In France, and other countries adopting the double standard, the silver coins, other than the small token coins, are of full weight and purity, thus resembling the

English sovereign, which contains the full weight of gold at which it is rated, and is the equivalent of its own weight of bullion, there being thus no gain to the Mint on the coinage thereof, as there would be no loss to the holder on melting. In France any given sum in silver weighs the same as  $15\frac{1}{2}$  times its value in gold. For example, ten francs in silver weigh the same as one hundred and fifty-five francs in gold; or, expressing the same fact in another form, any given sum in gold is worth the same as  $15\frac{1}{2}$  times its own weight in silver. The French Mint, it should be mentioned, was in the habit of coining, either free or at a mere nominal charge, both gold and silver for private persons, on presentation, in the same way as the English Mint does in respect to gold, the full weight left at the Mint in the form of bullion being returned to the owner in the form of specie. The object of these regulations in both cases has been the same, namely, to establish free trade in regard to money, the owner of the precious metal regarded as money being enabled to procure the stamp of Government thereto, in attestation of its weight and fineness, thus enabling him to pass it into circulation and use for the purpose of legal tender in the ordinary way for the extinction of debt. Under this system there has always been a large amount of silver circulating in France, where, in fact, it formed the principal currency, and it has been estimated that since 1795 there has been coined upwards of £200,000,000 of silver coins of full value, of which there are probably now in circulation some £80,000,000. The magnitude and importance, therefore, of the silver question to France is seen to be enormous. By way of contrast, it may be stated that the amount of silver circulating in this country is estimated at about £15,000,000, the whole of it being of nominal value only, and used simply as a token coinage, not being available as a legal tender beyond the trifling amount of forty shillings;

the silver in France, as already named, being legal tender to an unlimited amount.

The States which have practically adopted this system of a double standard, using both gold and silver, are France, Belgium, Switzerland, Italy, Spain, Greece, Roumania, the United States, Columbia, Venezuela, Chili, Uruguay, and Paraguay. The States using a gold standard are England, Portugal, Turkey, Persia, Australia, the Cape, Canada, Brazil, and the Argentine Republic; and those using the single silver standard were Germany, Holland, Denmark, Sweden, Norway, Austria, Russia, Egypt, Mexico, West Indies, Central America, Bolivia, Ecuador, Peru, Japan, China, India, &c.

The totals of gold and silver in use as money, viz., coin in circulation, coin and bars held by banks and in the markets (exclusive of jewellery, plate, and quantities supposed to be hoarded), may be given as follows :—

In 1871. Under	Quantities in Millions Sterling.		
	Gold.	Silver.	Silver.
	Full value.	Full value.	As change.
Gold system	160	14	26.5
Gold and silver system	840	121	31.5
Silver system	133	354	87.
Not accounted for	68	—	—
Since to 1871	49	16	—
	—	—	—
	£750	£505	£145

It will thus be seen that there is in circulation in the world an aggregate value of silver, of full value, of upwards of five hundred millions sterling, and the importance of the silver question, not to France only, but to the whole world, will become apparent, and fully justify the deep interest with which this question is now being generally regarded.

To supply the demand for wear and tear, and for further requirements, the annual production of silver in 1848 has

been estimated at about £8,000,000, at which it remained nearly stationary for several years, amounting, on the average of five years ending 1871, to over £10,000,000; on the average of four years ending 1875, to about £14,000,000, and being estimated for 1876 at £16,000,000, thus showing an annual supply equal generally to about two and-a-half per cent. on the stock in the world at any given period; not more probably than was necessary for wastage and other purposes.

The various European States using the double standard found it convenient, in 1865, to come to a common agreement as to the quantities of silver used as fractional coins which each State should yearly issue, and they formed among themselves a combination for this purpose, known as "The Latin Monetary Union," the members being France, Belgium, Italy, and Switzerland, to which was added afterwards Greece. The following description of the Convention by which the Union was constituted is from official sources :—

"This Convention determines, among other points, the conditions of the emission of divisional coins which are struck at a rate inferior to that of the monetary standard, giving rise to several important conditions established by the Convention, the emission of the same being limited, and its acceptance not being obligatory beyond a certain fixed sum; the loss from wear being borne by the Government by whom it is emitted. It assures the legal circulation of the money of the one State in all the States of the Union; this being only imposed, however, on private individuals with regard to the national coinage, though it is admitted for the coins of all the States belonging to the Union. The amount to be emitted by each country is calculated at six francs per head of the population."

In consequence of the fall in the value of silver, a law was passed, in 1873, enabling the Belgian Government to

suspend or limit the coinage of five-franc pieces. This principle was subsequently adopted by the States of the Latin Union ; and at the meetings of their respective delegates, which have taken place annually at Paris since 1874, the limitation of the silver coinage has been still further restricted. The action taken by all the members of the Union, in suspending the free coinage of silver, has naturally exercised a very important influence on the market. Up to that time it was open to anybody to go to the French, or any other Mint of the Union, with silver or gold, as the case might be, and get it coined ; the consequence was, that the moment either metal became depreciated, the holders took it to those Mints and had it coined ; but, in the year 1874, that process was arrested, because those Governments limited the amount of silver which they would coin ; and if it had not been for that change of policy, the silver which flooded the London market, and lowered the price, would have flowed into the Mints of those countries. This was a departure from the original theory, and constituted a cardinal alteration in their policy, the theory of the double standard being that anyone should be at liberty to bring metal to the Mint and get it coined to any amount ; but that was then altered. In its original conception, the policy of the Latin Union has been supposed to have been partly a political movement on the part of the French Empire to gain an influence in those countries, and partly the natural wish of countries so intimately connected to have the same coinage, and they adopted the French coinage of that time as being that of the predominant power ; it was not formed at all with reference to the question as between silver and gold, they simply adopted the French currency of the time.

In the meantime, France has taken up an "expectant" attitude ; the Government, last year, procured the assent of the Legislature to a provisional enactment, to the effect that

"The manufacture of pieces of five-francs in silver may be limited or suspended by the Government; the present law having force only till 31st January, 1878." What her ultimate policy may be it is impossible to say; on the one hand, she might begin to coin silver in unlimited amounts, and that would take silver off the market; this course is, however, scarcely probable. On the other hand, the Government may go further, and demonetise the silver in France; that has been proposed, and such action would throw an additional amount of silver on the market. Whichever way they may decide, their policy will have a considerable effect, either in promoting the depreciation of silver, or in retarding its depreciation; and that policy, with regard to the future, is, in the opinion even of the most competent authorities, alike obscure and uncertain. One thing in regard to it is both certain and clear, namely, that the decision, when taken, will constitute a force of the first magnitude.

#### IV.

The bi-metallic system, adopted by France and the Latin Union, has found so much favour in the eyes of some economists, principally French, that great efforts are now being made to induce this country, along with the other leading nations of the world, to enter into an arrangement whereby either metal would be used and received as money, and thus avert the actual and future decline in silver. The leading advocate of these views is the eminent French economist, M. Cernuschi, who says:—

"France being a market at the fixed rate of  $15\frac{1}{2}$ —a market always open to all nations—the  $15\frac{1}{2}$  was enforced on every nation. Neither in England nor in America, neither at Constantinople nor at Calcutta, were people willing to give more than  $15\frac{1}{2}$  of silver for 1 of gold, nor more than 1 of gold for  $15\frac{1}{2}$  of silver. The legal rate of

France was the regulating rate of the whole world. It was in this manner that the relative value of gold and silver always remained stationary in the world—so stationary indeed that in English statistics the quantity of silver could always be expressed in gold sovereigns. A gold sovereign always represented a fixed weight of silver. Now, however, the old bi-metallic constitution is no longer at work in Europe. France now coins gold alone. Europe is making a mono-metallic experiment. Here is the sole cause of the depreciation of silver. Nowhere does the law any longer link the value of silver with the value of gold, hence the reason why the value of silver will no longer have any fixity.

"Silver was more than simple merchandise, it was a legal tender. All the new silver was entitled by law to be worth, and was worth, as much as the silver formerly coined; it will be no use waiting years and years, silver will never recover the value which it possessed when it was a legal tender in Europe. Bound up with gold by the French 15 $\frac{1}{2}$ , the value of silver was as stable as that of gold; it will henceforth be as unstable as that of copper. Inaction will only aggravate the evil, and the only effective action in this matter is that of legislation. Bad laws have been passed; let there be good ones. *Lex abstulit, lex dabit.*

"It is not possible to re-construct the past just as it was: Germany cannot re-sell gold to become again silver mono-metallic, and France cannot alone at her own risk and peril re-commence coining silver. Bi-metallism can only be rehabilitated by the co-operation of all States, India included. The mischievous mono-metallism cannot be abandoned without establishing a bi-metallism still more beneficial than the French bi-metallism—universal bi-metallism.

"Would it not be advisable to agree that the ratio 15 $\frac{1}{2}$  might be modified after a certain period? No; either the ratio is irrevocable, or bi-metallism cannot stand. . . .

No depreciation can befall one metal relatively to the other, and consequently the relation between the weight of the gold coin and that of the silver coin never needs alteration. Knowing that he could prescribe for perpetuity, the legislator of 1803 took good care not to say that the  $15\frac{1}{2}$  should be merely provisional and subject to modification; the  $15\frac{1}{2}$  was never modified, and during three-quarters of a century it governed the relative value of gold and silver in the entire world. It will appertain to the International Congress to re-establish it, to declare it universal, and thus to give it absolute stability. This will be a great benefit for all nations."

In a table already given there will be found the actual ratio which existed during the first half of the century in Europe, by which it will be seen that the actual ratio never was, on an average of years, the normal rate of  $15\frac{1}{2}$ ; on the contrary, from 1820 till 1850, it would appear that silver was relatively cheaper than gold, so that instead of one ounce, or one pound, weight of gold being worth exactly  $15\frac{1}{2}$  ounces or pounds, as the case might be, of silver, it was worth, on the average, for each of the decades ending 1850, 15.80, then 15.67, then 15.88, thus showing a profit sufficient to induce the holder to send his silver to the Mint, and keep his gold for the outside world; this, therefore, he did, and the currency of France became substantially silver, as indeed the French people desired, for in their language one word, *Argent*, expresses at once the idea of silver and that of money. Under the free action of this system there was coined in France, between the years 1803 and 1848, gold of the value of £47,450,000, and silver of the value of £155,680,000, thus showing a preponderance in favour of the latter metal of rather more than three to one, when, as shown above, silver was, during the whole of the period, relatively the cheaper metal.

In 1848 occurred the discoveries of gold in California,

followed immediately afterwards by further discoveries of this metal in Australia, and then the previous relations between the metals were disturbed. The following table will show the production of the precious metals from that date, the averages being given for periods of five years :—

ESTIMATED PRODUCTION OF GOLD AND SILVER.

GOLD.

1848	Stock	-	-	-	£400,000,000
1848	Annual production	-	-	-	£10,110,000
1852-56	Five years' average	-	-	-	29,900,000
1857-61	"	"	-	-	24,600,000
1862-66	"	"	-	-	22,700,000
1867-71	"	"	-	-	23,600,000
1872-75	Four years'	"	-	-	20,400,000

SILVER.

1848	Annual production	-	-	-	£8,720,000
1852-56	Five years' average	-	-	-	8,100,000
1857-61	"	"	-	-	8,200,000
1862-66	"	"	-	-	9,900,000
1867-71	"	"	-	-	10,600,000
1872-75	Four years'	"	-	-	18,900,000
1876	One year's	"	-	-	16,000,000

By the above it will be seen that whilst the annual production of gold had averaged ten millions, with a corresponding average of eight millions for silver, the yield of gold sprang up to thirty millions on an average of the years 1852-56, remaining at nearly the same high level, say at twenty-five millions, for the next five years, and at twenty-three millions for the subsequent five ; whilst silver slightly declined in productiveness, though rising during the years 1862-66 to an average yield of nearly ten millions.

Let us now examine what effect, if any, this change, in the relative proportions produced, had upon the proportions in which the metals exchanged for one another in the world.

The following table shows the ratio which silver bore to gold from 1851 onwards, being the first year when the gold had come forward in sufficient abundance to afford a fair test. This table is derived from the Report prepared for the American Government, by the United States Commissioner of Mining Statistics, and the relative values are calculated from the London quotations, which gives the price of a given weight of standard silver in shillings and pence sterling. There being in this country no charge for the coinage of gold, the price referred to varies exactly as the market values of the metals, and the ratio, therefore, can be calculated with perfect accuracy. London being the acknowledged centre of the commercial world, this ratio determines the relative value of the metals among civilised nations. The table shows annual averages only, not extremes :—

#### RELATIVE VALUES OF GOLD AND SILVER.

Date.	Ratio	Average.	Date.	Ratio.	Average.	
1851	-	15.46	-	1863	-	15.88
1852	-	15.57	-	1864	-	15.40
1853	-	15.38	-	1865	-	15.38
1854	-	15.38	-	1866	-	15.44
1855	-	15.36	-	1867	-	15.57
1856	-	15.38	-	1868	-	15.60
1857	-	15.27	-	1869	-	15.60
1858	-	15.86	-	1870	-	15.60
1859	-	15.21	-	1871	-	15.59
1860	-	15.30	-	1872	-	15.68
1861	-	15.47	-	1873	-	15.90
1862	-	15.36	-	1874	-	16.15
						15.817

## V.

The fact has now been made clear that, during the present century, there have been two important changes in the ratio which silver has borne to gold. Up to the period of the gold discoveries silver was below the fixed par value; then, from 1851 till 1866, it was of more value in the open market than the fixed ratio; while from the latter date it has gone on gradually declining. It has, therefore, passed through three successive stages. It will be interesting to consider the effects which these changes have had in France, where the ratio remained fixed by operation of law. We are told that, under the operation of that law, "no depreciation can befall one metal relatively to the other;" "there is no competition possible between the producer of gold, and the producer of silver," and no inducement to make payments in one metal rather than another, "their paying power being identical."

Free coinage of either metal being allowed in France, it is natural to suppose that, in choosing which metal to send in to the Mint, the holder would give the preference to that which he could procure in the form of bullion on cheaper terms. Thus, during the first half of this century, when one ounce of gold would purchase, on an average, somewhere about fifteen-and-three-quarter ounces of silver, it was found more profitable to send silver into the Mint, as there fifteen-and-a-half ounces would be coined free into as much currency as the one ounce of gold. From 1825 to 1848, inclusive, the French coinage was only 268,000,000 francs in gold, against 2,380,000,000 francs in silver, equal to £10,720,000 in gold, against £95,200,000 in silver. The result was that the whole actual currency of France was silver, the relatively cheaper metal having been used for the purpose.

The gold discoveries then took place; the change already

described in the ratio of silver occurred, this metal becoming relatively dearer than gold. Did the French people then carry their silver to the Mint? No, they knew their own private interests better. A very slight change in the value was sufficient to affect their policy. Though they had been accustomed to send in formerly large quantities of silver, they soon discontinued doing so; the coinage of five-franc pieces, which in 1851 amounted to francs fifty-seven millions, and in 1852 to francs seventy millions, fell to francs nineteen millions in 1853, and to fifty-three thousands only in 1854. The coinage of full weight five-franc pieces averaged for the five years ending 1855, thirty-four millions per annum, falling, during the next five years, to nine millions per annum, while, for the succeeding five years, it amounted to less than one-fifth of a million per annum; this decline exactly corresponding with the enhanced price of silver, as shown in the previous table of ratios.

During the whole of this period gold, being relatively cheaper than silver, was coined in preference, being sent into the Mint under the French law which permitted this option; and the result was, that, from 1851 to 1867, inclusive, the coinage of gold amounted to francs 5,806,000,000 = £232,240,000, while that of silver only amounted to francs 883,000,000 = £15,320,000, or, on an average of years, £12,900,000 of gold, against £876,000 of silver. These figures are instructive in the highest degree; they show the change which was taking place, and which was due entirely, not to the policy of the Government, but to the action of the public, simply as individuals; each one consulting only his own interest, and being guided by that motive alone.

It has been shown already that the silver coinage in France diminished from thirty-four millions per annum to nine millions, then almost ceased, during the years 1851-66, and reference to the following table will show what became of

## SILVER IN FRANCE.

		Balances.	Coinage.
Import.	Export.	Average.	5-franc pieces. Average per annum.
1851	78	fcs.	57,496,000
1852	3	"	69,951,000
1853	117	"	19,458,000
1854	164	"	53,000
1855	197 — 80	"	24,805,000    34,250,000
1856	284	"	45,777,000
1857	360	"	467,000
1858	15	"	133,000
1859	171	"	16,000
1860	157 — 197	"	—    9,279,000
1861	62	"	110,000
1862	86	"	105,000
1863	68	"	108,000
1864	42	"	160,000
1865	72	— 87	"    485,000    198,000
1866	45	"	189,000
1867	189	"	54,051,000
1868	109	"	98,620,000
1869	112	"	58,264,000
1870	35	+ 98	"    53,648,000    51,954,000
1871	15	"	4,710,000
1872	102	"	389,000
1873	181	"	154,649,000
1874	360	"	59,996,000
1875	194	+ 170	"    75,000,000    58,949,000
1876	-148		

the silver in the meantime. While France, up to 1851, had been in the habit of importing that metal, she then ceased doing so, and for the next fourteen years regularly exported the silver to such an extent, that for the five years ending 1855 the exports averaged eighty millions of francs per annum, with the still higher average of one hundred and ninety-seven millions for the next five years, thus showing that the movements of the metals were vitally affected by the change in the choice of the metal preferred for the coinage.

France had now fallen away from her old love for silver. *Argent* still meant money, but did not necessarily refer to that metal, and gold had now become practically the circulating medium. A large portion of the new gold was required for this purpose, and thus there sprang up an "increased demand," corresponding in time with the "increased production;" this prevented any great decline in the value of gold, either in regard to its purchasing power, or command over commodities in general, or in relation to silver. But whilst there thus occurred an increased demand for gold, of which otherwise there would have been a superfluous quantity, there occurred likewise, necessarily, a diminished demand for silver for the purpose of coinage, and the operation of these joint causes was to maintain both metals more steady in their relative values than they would otherwise have been. It is this *compensatory*, or *equilibratory action*, which helps to steady the ratio, and which operates advantageously in the first instance, by affording an outlet for the excess of supply, at any moment, of that metal which happens to be more abundant. It must be observed, however, that this process could not continue for an indefinite period. Under the operation of what is known as Gresham's Law, viz., that *Bad Money drives out Good Money*—or, as we should prefer to express it, *Inferior Money drives out Superior Money*—the tendency is for the

currency of a country, under such a system, to change from the one metal to the other, according as there are changes in the supply and demand, elsewhere, or for other purposes ; it thus loses that fixity of value which is the chief desideratum in a currency, and cannot, in fact, be fairly described as a currency of two metals, but is an "alternative" currency, consisting sometimes of one metal and sometimes of the other. No country can maintain two standards of value in actual use at the same time ; and in every country which has adopted the double standard, that metal has been used, to the exclusion of the other, which was over-valued as coin as compared with the value of the bullion contained in the coin when tested by its market price in other countries. Consequently, in every country having the double standard, the metal which is over-valued as coin has been used to the exclusion of the other. This is a system which is not conformable to the highest theory, and has been abandoned in practice ; because the laws of Nature are stronger than the laws of France, and the selfish instincts of mankind make them ready to grasp a profit, even though of the very smallest percentage.

## FRANCE.

Years.	Ratio.	Total Gold production. Av. per An.	Imports and Exports of Silver. Balances.	Coinage 5-franc pieces. Av. per An.
1831-35			+ 98	160
1836-40	15.670		+ 94	74
1841-45		10.110	+ 97	72
1846-50	15.830		+ 127	103
1851-55	15.410	29.900	- 80	34
1856-60	15.294	24.600	- 197	9
1861-65	15.388	22.700	- 87	.2
1866-70	15.562	23.600	+ 98	52
1871-74	15.817	20.400	+ 170	59

## VI.

Although unable to concur with the French economists in thinking an "alternative" currency a good arrangement, we are firmly persuaded that silver is well suited for use as money, and that it would be an advantage to the world if it were more largely used in that capacity, in the more civilised nations, where it might circulate alongside of gold, and enter largely into the currency. It possesses some advantages of its own, even from its lower value, being thus better suited for transactions of small amount where the sum is low, and also because the pieces, although of small value, can in such case be made of a reasonable size, and are, therefore, more suitable for handling by all classes of the community. It seems to us, therefore, matter for regret that it should have become so generally demonetised, and that an almost exclusive preference should be everywhere shown for gold. If one metal is to be used to the entire exclusion of the other, then we think that the advantage is in favour of gold, but it might be quite possible to use them both *jointly*, and this, for some reasons, would be preferable to using either of them *singly*. From the earliest times they have both been used as money, and the natural instincts of mankind, in this as in so many more instances, prompted them to right action, without investigating any theory on the subject at all. The fact that they are, in the long run, produced in nearly equal quantities in value is itself a significant circumstance; the present value of all the gold in the world is estimated at £750,000,000, and that of the silver at £650,000,000, so it would appear that there are about equal masses of value available for coinage, if required. Although the annual production of either metal varies considerably, from time to time, it seldom happens that there is an increased or diminished supply of both at once, and thus it is that the

variation in the production of both metals is much less than the variation in the production of either metal, taken singly. This will be apparent from the following table:—

ANNUAL PRODUCTION.

	Gold.	Silver.	Total.
1852 ...	£36,550,000	£8,120,000	£44,670,000
1864 ...	22,600,000	10,840,000	32,940,000
1871 ...	21,400,000	12,210,000	33,610,000
1875 ...	19,500,000	16,100,000	35,600,000

This will show that while during a very few years the annual supply of gold fell to one-half, that of silver in the same time having exactly doubled, the variation in the supply of the joint metals was only as 44 to 35, and this, be it observed, during the time when there have been perhaps the greatest and most sudden fluctuations ever known in the productions of each of the two metals. Now, this would seem to point out the desirability, at all events, of adopting the Joint Metal as the Standard of Value; it possesses, in a higher degree than either metal singly, that prime quality—stability of value. There have been changes in our day in the value, or purchasing power, of gold, the standard of value in this and some other countries, and now there is a still greater change in the value, or purchasing power, of silver, which has been adopted as the standard of value in some other countries. Those nations which have adopted the French bi-metallic system, which we have called the “alternative” system, have not escaped; they have suffered most of the evils which befall a nation choosing the cheaper metal for their standard, for they have given their subjects the option of changing the standard from time to time; in fact, they have never had a standard of *both* the metals, as they vainly desired, but a standard sometimes consisting of the one metal and sometimes of the other. Their intentions were good, but good intentions are not sufficient to avert failure.

*If a nation wishes to have a composite legal tender, consisting of both metals, it must make the use of both compulsory, not optional.* If the option remains with the debtor, as in France, he will choose the cheaper metal; if the option had been with the creditor he would have chosen the dearer metal, and all the phenomena we have described would have been reversed. It is difficult to know why, in this respect, the debtor should have had the advantage, which would have been grossly unfair, were it not that, in most other cases, the laws have been made so as greatly to favour the creditor. The debtor, however, had one additional pleasure, or drawback, as he might choose to consider it; the law never intended that he should have this advantage; it was an incident which resulted without knowledge or intention, and the result has been denied after having been accomplished. To maintain perfect fairness in the fulfilment of contracts, especially those which, like the terms of leases or annuities, spread over a lengthened period, or, like those of life insurance, are only to be fulfilled in a distant future, the Standard of Value should be as firm and invariable as human ingenuity can devise. The "Composite Metal," consisting of equal values of gold and silver, seems to attain this object better than any single substance yet known. The proportions of 1 to 15½ seem best for practical purposes, and would be more readily accepted than any other ratio, though we must bear in mind that such ratio is neither scientifically nor practically perfect; it is simply a plan, not a principle.

Let us apply this form of True Bi-metallism to the case of France, or any country similarly circumstanced; let it be decreed that, in the discharge of all obligations amounting to some fixed sum, say one thousand francs, or upwards, the debtor shall be entitled to pay, and the creditor shall have the right to demand, one-half the amount in gold and the other half in silver. This is real bi-metallism; this is using

the two metals *jointly*; this would be making law and fact correspond with theory, which is not now done under the present system. So long as the fixed ratio was preserved, the operation of the law would be imperceptible, for so long as the two metals remained of equal value there would be no advantage in offering the cheaper or demanding the dearer metal; the present system does not effect this. Either metal, as at present, might remain legal tender for small amounts, say under one thousand francs.

There need be no objection on the score of inconvenience, for though using the two metals jointly as the Standard of Value, it would seldom or never be necessary to use both in making payments. It would suffice that they were lodged in the Bank, and that notes were redeemable in the two metals jointly, unless otherwise desired. Or, better still, the necessary quantum of the metals could be lodged in the Mint, and certificates, or notes, given against them for the exact amount deposited, and no more; these being legal tender, which might be required in fulfilment of all obligations, and so would preserve the stability of the standard of value, while the Bank would be free to issue its own notes, and, though legally bound to meet them in Mint certificates, as named above, would seldom find any objection on the part of its note-holders to take either gold or silver as offered. So long, in fact, as the two metals were at par there would be no inducement, unless for private convenience, to demand such certificates, which would only be met in the joint metals; and neither would there be any inducement to reject either metal which the Bank might offer. But the instant there was a change in the ratio, such as has already twice happened under the present French system, there would arise a preference for notes over the depreciated specie, whichever it might happen to be, and a corresponding disinclination on the part of debtors to pay away the dearer

metal ; so that the cheaper metal would require to match itself with the dearer one, and being thus united in the Mint, or Issue Department, would be available for its legitimate use, as legal tender, to the extent to which it is fairly entitled, say one-half, and no more. Then would come into play that *compensatory action* of which we have previously spoken ; it would be impossible that the cheaper metal should be used exclusively, and it would likewise be impossible that the dearer metal should be driven from circulation ; they would both be equally necessary, and the increased demand for one would be met with a corresponding demand for the other.

These suggestions are thrown out with a view to mitigate the heavy fall in silver, consequent mainly on the demonetisation of that metal in Germany. The heavy strain thus thrown on France she has been unable to bear under her present bi-metallic law, which permits the use of either metal, of course leading to the use of the cheaper one, or that for which the demand is less intense ; she has been compelled to suspend the free coinage of silver, and is anxious about the future. She is, therefore, in a favourable condition now to avail herself of the true application of bi-metallism, which would bring to her great relief, and would, in her case, be no departure from the fundamental principles of her system, but rather a strict adherence to them. We do not know what proportion of silver the Bank of France now holds, but last year she held fifty-five millions of gold, along with twenty millions of silver, estimated in sterling, and probably the proportions are still about the same. If her notes, then, were made redeemable, not in one or other of the metals, but in both jointly, and if a corresponding obligation were imposed in regard to all other contracts in France, not otherwise specially provided for, free coinage of silver might be resumed with impunity. In the instance given above, the Bank of France would tell off twenty millions

of its gold to match the twenty millions of silver ; it would then find itself with a gold surplus of thirty-five millions ; but in order to comply with the demands which might come upon it under the new rule, it would find it expedient to part with half that surplus of gold, gradually exchanging it for silver, until, as the result, there would be equal values of gold and silver in its vaults. This would release the dearer, and tend to appreciate the cheaper metal, thus restoring that harmony which the old system endeavoured, vainly, to accomplish. Any redundant silver coinage in France would find its way to the Bank, to be there mated with gold, before creditors could be compelled to accept it for larger payments than one thousand francs, and every five-franc piece in existence would retain its full exchange value, on the single condition that it shared its utility with a corresponding value in gold, and was content with equality, without seeking supremacy.

This application of bi-metallism has the advantage that it is available for any one country, without the assent or concurrence of any other nation being necessary, and is, therefore, possible of attainment, whereas the proposal of "universal" bi-metallism might have to wait long for its accomplishment ; and this plan would, if applied in any one instance, effectually prevent that drain of the dearer metal, and that inundation of the cheaper one, which is unavoidable under the present system. France would no longer suffer from the financial policy of her neighbour, Germany. A similar application of the same principle could be made in Germany, which has now, in fact, a circulation consisting of both metals. No new coinage would be necessary in the case of either countries, and there would be no clashing of interests. It would enable, nay compel, the Banks of countries adopting the Composite Standard to keep one-half of their reserves in silver ; and though that metal is now depressed, there may again come a change, and the inclination may be the other way.

To show, to some extent, the demand this would create and maintain for silver, the following table, giving the reserves of the leading European Banks, may be considered:—

	Coin and Bullion.
Bank of England      ...	£27,355,000
Bank of France      ...	87,072,000
Austrian National Bank      ...	18,660,000
Belgium      "	4,618,000
Netherlands      "	<u>12,617,000</u>
	<b>£145,822,000</b>

These reserves are mostly in gold; the proportion of silver in the Bank of France last year has been shown; at the same time one-half of the reserve in the Austrian Bank was in silver; but the English reserve consists entirely of gold, and of the whole, we should not estimate that more than thirty millions consist of silver. Under the Composite system these five Banks would be found holding about seventy millions in silver, along with seventy millions in gold, and there would, therefore, always be an ample store of either metal to meet a sudden demand for extraordinary purposes.

America has not yet finally decided on the system on which, as we hope, her future financial policy may be firmly based; but she has always aimed at bi-metallism, though she has never accomplished it, from the inherent defects of the only form of it which has been tried; she is therefore free, and all the more so from her paper currency being now depreciated, and can adopt, as her permanent standard of value, that which appears to her the best. The silver trade dollar is worth in gold ninety-five to ninety-six cents, while the Government and Bank-note paper dollar is worth about ninety-seven cents in gold. The silver being the least valuable of the three several classes of currency—gold, paper, and silver—it will soon, to the extent of its function, drive the

two former out of circulation. The silver being the cheapest, will be first paid out by every holder; the gold and the paper, each being worth a little more, will be held in reserve. Thus, the silver coin, if encouraged, will soon become the chief circulating medium. With the Composite Standard she might still use silver as the circulating medium to a very large extent, and such currency is probably better adapted to the habits and requirements of her people than one of gold; she, too, could adopt such a system whether other nations did so or not, as in every case such other nations would be powerless to drain her of one metal to the exclusion of the other. A drain of metal generally is, of course, a danger to which every nation, having any, is subject; but her standard of value would be firm, and little variable.

So far nothing has been said of England; here we have a single gold standard, nevertheless this country might, with great propriety, enter the proposed International Conference on the Silver Question, for the purpose of considering whether it is wise to provide, by treaties and concurrent legislation, for the use of both silver and gold by all the commercial nations upon a fixed relative value, there considering all the proposals and suggestions which might be made. In the event of other leading nations generally giving the preference to the Composite Standard of Value, she might possibly find it her interest to do so likewise. There need be no fear in regard to existing contracts at the time of change, if ever made, for reason and justice would demand that existing contracts should be fulfilled in gold, at maturity, if required by the creditor, public or private.

This Silver Question has many sides; but we shall be glad if these suggestions help to elucidate some of the difficulties, and promote a solution which is important to the interests of so many persons and of every nation.

## VII.

America is probably more free than any other country in regard to the coinage system, and any change, therefore, could be more readily adopted by her than by either France or England, which have already a large amount of hard coinage in existence. The first necessity of a commercial people is that their Standard of Value should be of itself accepted by other commercial nations, for one of the chief uses of the precious metals as a Standard of Value is for the purpose of liquidating balances with other countries. As long as silver is merely an article of commerce in Great Britain, where the bills of America due to other countries are finally adjusted, the use of silver only as a standard in America will not produce the results which ought to follow from a resumption of specie payments. London is now the clearing-house of the world, and as balances there must be settled in gold, other commercial nations must make that metal the sole Standard of Value, unless England can be induced to accede to a general arrangement securing the adoption of the bi-metallic standard. The old American dollar contained 412½ grains of silver, nine-tenths fine, but these coins have been nearly all driven from circulation. In deciding on the weight of the future silver dollar, there would be great advantage in assimilating it to the existing French silver five-franc piece; this coin contains 347.25 grains of fine silver, and it would be well to adopt that weight. England might also adopt the same weight for a new English Dollar, or four-shilling piece. It would then only be necessary for America to adopt the English sovereign as her gold five-dollar piece, and her course would be easy. Her Standard of Value, on the basis of which all contracts would be made, would consist of one-half gold and one-half silver dollars, of the same weight and value as the French écu, and the English dollar. She might

in such case coin chiefly, in the first instance, silver dollars only, which would be required mainly for circulation and general use in minor transactions. It is only for small amounts that coin ever passes, all larger ones being arranged, in one way or another, by the use of paper. The needful gold, for deposit in the Mint or Banks, could readily consist, in the first instance, of bullion or English sovereigns. The value of the dollar would remain fixed at four shillings, through being thus linked with gold, even if there occurred a further decline in silver. The Circulating Medium need not, necessarily, be identical with the Standard of Value, as may be seen in the instance of a paper currency, which will be maintained at par value "so long as it is convertible on demand into specie;" so a silver currency will maintain its full par value so long as it is available for direct conversion into the Standard of Value itself. In this way America could utilise her present large supplies of silver without finding herself with a currency, or standard, of less value than that of other nations; she would likewise be able to replenish her currency from England, and sovereigns could readily be circulated there. It would be necessary to enact, in America, that debtors should have the option of paying in either gold or silver to the extent of one hundred dollars only, the creditor for larger sums being entitled to demand notes only, which would be redeemable in Composite Standard money, consisting one-half of gold and one-half of silver.

The adoption of the "Composite Metal," as the basis of the Standard of Value, would much facilitate the resumption of specie payments in the United States. There the country is divided in opinion as to the shape which resumption should assume. One party holds that advantage should be taken of the current low value of silver to redeem the debt in that metal, which they consider themselves entitled to do, as under the contract with the Bond-holder he cannot claim, as

of right, gold, or, in some cases, even silver, but only "coin," or "lawful money of the United States." A very large and influential party favours this view, which would open up a market for one of the native products of the country, and would also enable the Government to return to specie payments on somewhat easier terms than if gold were required. Another party, however, maintains that gold alone should be adopted as the standard, and that America should thus be brought into harmony with the leading nations of Europe. Conflicting interests, as well as opinions, are, of course, involved, and, as a result, the Commission appointed specially to consider this matter has recommended the adoption of an unrestricted coinage of both metals, although it is unable to fix the standards at which the relative values of the two metals shall be fixed. Strong attempts are now being made to repeal this proposal, and the final decision remains uncertain. A double standard of value attempted to be set up in metals whose relative market values are liable to constant fluctuations, is a proposal which can hardly be carried into execution without disaster, and would be a dead letter, at the best, if it were. The practical effect of resumption on this basis will be to secure the preference of the cheaper metal, which at present is silver, and thus America will find herself with a standard and currency consisting exclusively of that metal.

Now let us consider the effect which the adoption of the Composite Standard would have upon the American Note and Bond-holder. At present, if paid off at par, in gold, at New York, his \$500 bond would be worth £108 2s. in London, whilst if paid off, in silver, it would be worth £95 16s. It may be admitted to be doubtful to which of these results he is entitled, and the option seems to remain with the indebted Government, which, either directly or through the operation of the so-called double system, may

ultimately pay him off in silver worth only the lower sum. Suppose, however, that, through the adoption of the Composite Standard, his claim was met one-half in gold and one-half in silver, then he would receive the mean between these two amounts, or the equivalent of £99 9s. in liquidation of his bond for five hundred dollars. This may be regarded as the mean average value of his claim. By bringing the American dollar into harmony with the English system, as named above, the creditor would receive in discharge of his claim for five hundred dollars, the equivalent of one hundred pounds in England, which would be one-half per cent. more advantageous to him than the present value thereof, fairly computed in both gold and silver, and the difference between paper and coin being thus so small, the Government would be relieved from a large portion of the difficulty they will otherwise have to face when resuming specie payments. There would be scarcely any contraction of the currency required, and thus the fall in prices which generally attends resumption would be avoided. Both Note and Bond-holders would be better off than if repaid in silver, and the permanent stability of the American Standard would be secured.

In England there is no four-shilling piece, or pure silver coin ; we are therefore tied by no precedent, and no arrangements. In coining pure silver for the first time, therefore, we should naturally adopt the same weight as that chosen for the leading French and American silver coin, as the silver coinages of the three countries could then be interchanged with advantage. Such pure silver coins might be made legal tender here to the extent of one hundred, which would be equal to £20, when used by themselves, and, in conjunction with gold, they could be legal tender to the extent of one-half. The Bank of England could hold one-half of its reserve in silver, and our Standard of Value would be identical with

that of America. There, however, no doubt, the ordinary circulating medium would be silver, while here it would be gold, and either nation could borrow direct from the currency of the other, when required.

*Let the weight of the English sovereign be adopted as the fixed point in gold, and the weight of the French five-franc piece be adopted as the fixed point in silver, and let all other computations and arrangements be subordinated thereto.*

It must be mentioned that, if the proportions of  $15\frac{1}{2}$  to 1 were adhered to, the English four-shilling piece would require to contain 350.625 grains of silver, in lieu of 347.25 recommended above; but then it would correspond with no other system and no other coin. England and America are neither of them bound to the proportion of  $15\frac{1}{2}$ , and the adoption of the above weight would place the proportions at 15.350. The  $15\frac{1}{2}$  has been displaced by force of circumstances, and the nations are free to adopt the proportion they consider best. In fact, the Netherlands Government, in 1875, passed a law fixing the ratio of gold to silver at 15.625. We are firmly convinced that no power on earth will ever persuade the English people to change the weight of the English sovereign to make it correspond with twenty-five francs, but the same result can be accomplished in another way, and the fixity of the sovereign is more important than the  $15\frac{1}{2}$ ; in fact, the one exists and the other does not. England might be induced to coin silver, and accept the Composite Standard, if France and America did the same, but the interests bound up with the sovereign are too great to be given up entirely. There would be little or no change in England, and America has to make a change somehow. Prejudices, as well as interests, have to be consulted, and if the American dollar corresponded with one-fifth of a pound sterling, their fates would be linked with security.

The English silver dollar, or four-shilling piece, would readily find a useful place in the circulation here; it would be a coin specially suited to the wants and requirements of the working classes and of retail trade, and could be very largely used in many transactions; it would soon become the unit of account in retail transactions, and would answer the purpose better than the higher-valued sovereign. There is certainly a want of some coin, between the shilling and the pound, which should be of higher value than the florin, a coin which has never succeeded in getting into the favour with which the old crown piece was regarded. The dollar should be coined at the Mint free, and the full weight of silver delivered as bullion should be returned in the form of coin, as is now done in the case of gold. There could be no depreciation as compared with gold, for if redundant they would be available for export, for which they would have many advantages, and would thus reduce the strain upon gold in cases where metal had to be exported for the settlement of exchanges. Being identical in size, weight, and purity with the American dollar and the French five-franc pieces, the currencies of the three countries would be interchangeable to the great advantage of all concerned. The Standard of Value being also identical in the three countries, Exchange operations would be much facilitated, and the merchant would save the differences of which he is now deprived by the intervention of the banker or bullion dealer. The metallic basis of the country would be widened by the increased use of silver, and thus the way be paved for the complete disuse of bankers' promissory notes in favour of more approved and more modern forms of credit.

The only coinage of the three countries which would not be in harmony would be the French Napoleons, but they do not now circulate in England, nor do they correspond with any point in the English or American systems. France

would have to adopt the new proportion of 15.350 in lieu of the 15 $\frac{1}{2}$ , but, as she is now unable herself to retain the latter, she must make some concession to get England and America to adopt the joint use of silver with gold, and through this action on their part she would gain more than the loss involved to her in the slight change in the rating of silver. As named already, the 15 $\frac{1}{2}$  has been overthrown, and it is only by common agreement that a ratio can be adopted. France will find it impossible to get all other nations to adopt her system of the double standard on the basis of the 15 $\frac{1}{2}$ ; and, in fact, it is not France that desires it, but only a minority of her financiers. It might probably be better if silver could be rated lower than the 15.350 named above, but then France would lose the advantage of her silver coinage touching any point in the English or American systems, and unless all nations would consent to start *de novo*, there must be some inconvenience suffered somewhere; that would be slight, however, under the suggestions given above.

France would gain the general adoption of the bi-metallic system, thus securing for her in the future what she has attempted in the past, namely, the joint use of both metals, now endangered—her principle being good, though her plan was bad—and she would also witness the triumph of the five-franc piece becoming the great and universal Silver Unit of the world, rivalling the position held in respect to gold by the English sovereign; so that she would obtain that share in influencing the commercial ideas and usages of the world to which her greatness, both in thought and action, entitles her.



**FREE PUBLIC LIBRARY, MUSEUM, AND GALLERY OF ART,**

**OF THE BOROUGH OF**

**LIVERPOOL.**

---

**MUSEUM REPORT, No. 1.**

---

**MOLLUSCA OF THE ARGO EXPEDITION TO THE  
WEST INDIES, 1876.**

**BY THE**

**REV. HENRY H. HIGGINS, M.A.**



### PRELIMINARY NOTE ON THE VOYAGE OF THE "ARGO."

TOWARDS the close of 1875, a voyage to the West Indies was planned by Reginald Cholmondeley, Esq., of Condrover Hall, Salop, in pursuance of his desire to enrich his already extensive and well-stocked aviary with specimens from the Antilles and Tropical America, and to have an opportunity of observing the habits of animals, and especially of birds, in their native haunts. For this purpose he chartered the fine new screw steam-ship "Argo," of 750 tons register, built by Alfred Holt, Esq., of Liverpool, which thus became duly qualified to leave the port as the Royal Mersey Steam Yacht "Argo."

Unwilling that so fine an opportunity for collecting in all departments of Natural History should be lost, Mr. Cholmondeley expressed to the Committee of the Liverpool Free Public Museum his readiness to accommodate in the "Argo" a member of their Institution, to be nominated by the Committee; generously offering to place the whole of the invertebrate specimens collected at the disposal of the Liverpool Museum.

The Committee conferred the honour of their choice on the writer of this Report, who, ultimately, by an extension of Mr. Cholmondeley's kind offer, went on board accompanied by two assistants selected from the Museum staff, Mr. John Chard and James Woods. The "Argo" left Liverpool on the morning of January 16th, 1876, and returned to the same port on the 27th of the following May.

The places visited were Madeira, Antigua, Barbuda, St. Kitt's, Guadaloupe, Dominica, Martinique, St. Vincent, Grenada, Trinidad, Pedernal, La Guayra, Caracas, Puerto Cabello, Tucacas, Santa Marta, Savonilla, Cartagena, Jamaica, Cuba, Vera Cruz, the Bahama Islands, and Philadelphia.



# LIVERPOOL MUSEUM

## REPORT, No. 1.

---

### MOLLUSCA COLLECTED DURING A VOYAGE TO THE WEST INDIES IN THE ROYAL MERSEY STEAM YACHT "ARGO."

---

The shells in the following list represent the conchological results of dredging and shore collecting during the Argo Expedition. Every possible facility and assistance was kindly granted by Mr. Cholmondeley, but circumstances over which he had no control prevented all dredging from the Argo, thereby entirely excluding deep sea dredging, for which due preparations had been made. Even in harbour, the boats and crew of the yacht were frequently not available for marine collecting, and in some localities a few hours only could be given to the work. The names in the following list are those adopted by Messrs. H. and A. Adams, in their work on the "Genera of Recent Mollusca." The work of identification has been done by Mr. F. P. Marrat, conjointly with myself. The figures in the Plate were drawn by Mr. John Chard, of the Museum staff.

Species marked † have not, so far as the writer is aware, been previously recorded from the West Indies.

Comparatively very few species are recorded from beached-specimens only. Nearly all of them were dredged or picked off the rocks in a living state.

### MADEIRA.

#### UNIVALVES.

*Purpura.*

*Thalessa deltoidea.* *Lam.*  
*Stramonita hæmostoma.* *L.*

*Trochocochlea turbinata.* *Born.*

*Patella penicillata.* *Reeve, var.*

## ANTIGUA.

Antigua is not a very favourable locality for shell collecting. Falmouth harbour has a fine sandy beach; but nearly all the shells obtained there were attached to corals and sponges, dislodged by a diver using a crow-bar and ropes. In English Harbour some small shells were dredged; but the most productive locality was found to be the walls and wooden piles of the government coaling station, on which, at low water, a variety of shells were collected without difficulty.

## UNIVALVES.

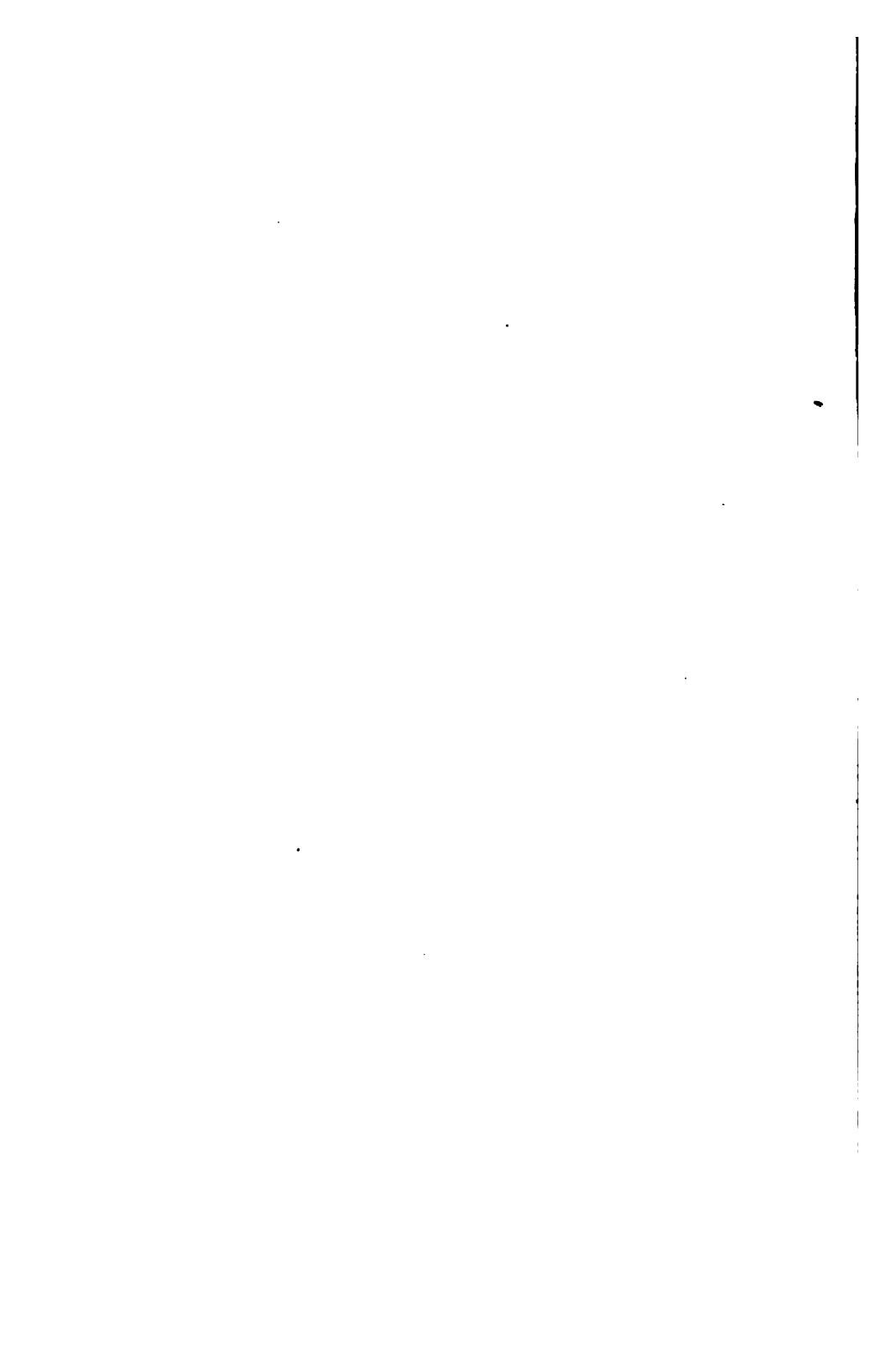
<i>Purpura patula.</i> <i>L.</i>	<i>Rhizochilus.</i>
† <i>Stramonita fasciata.</i> <i>Reeve.</i>	<i>Coralliophila abbreviatus.</i> <i>Kien.</i>
<i>Thalessa deltoidea.</i> <i>Lam.</i>	<i>Cantharus.</i>
<i>Tritonium.</i>	<i>Tritonidea Loroisi.</i> <i>Petit.</i>
† <i>Simpulum vestitum.</i> <i>Hinds.</i>	<i>Turbo.</i>
† <i>Gutturnium tuberosum.</i> <i>Lam.</i>	<i>Livona pica.</i> <i>L.</i>
<i>Columbella mercatoria.</i> <i>L.</i>	<i>Nassa.</i>
<i>Mitra.</i>	<i>Hima ambigua.</i> <sup>1</sup> <i>Pult.</i>
<i>Nebularia striatula.</i> <i>Lam.</i>	<i>Bulla nebulosa.</i> <i>Gould.</i>
<i>Leucozonia nassa.</i> <i>Gmel.</i>	<i>Cypræa.</i>
<i>Murex.</i> <i>Sp !</i>	<i>Trivia pediculus.</i> <i>L.</i>
<i>Trochus.</i>	<i>Nerita.</i>
<i>Lithopoma tuber.</i> <i>Gray.</i>	<i>Pila peloronta.</i> <i>L.</i>
<i>Cerithium candatum.</i> <i>Sow.</i>	<i>tessellata.</i> <i>Gmel.</i>
<i>Modulus lenticularis.</i> <i>Chem.</i>	<i>striata.</i> <i>Chem.</i>
<i>Tectarius muricatus.</i> <i>L.</i>	<i>Fissurella.</i>
<i>Emarginula.</i>	<i>Cremides clathratula.</i> <i>Reeve.</i>
<i>Subemarginula depressa.</i> <i>Bl.</i>	<i>rugosa.</i> <i>Sow.</i>
<i>Crypta.</i>	<i>nodosa.</i> <i>Born.</i>
<i>Crepipatella aculeata.</i> <i>Chem.</i>	<i>Lucapina Dysoni.</i> <i>Reeve.</i>
<i>Calyptria equestris.</i> <i>L.</i>	<i>Vermetus lumbricalis.</i> <i>L.</i>
<i>Cuma diadema.</i> <i>Lam.</i>	<i>Lucerna (Helix).</i>
	<i>Dentellaria formosa.</i> <sup>2</sup> <i>Ferus.</i>

## BIVALVES.

<i>Cardium.</i>	<i>Radula.</i>
<i>Trachycardium muricatum.</i> <i>L.</i>	<i>Ctenoides scabra.</i> <i>Born.</i>
<i>Lithophaga.</i>	<i>Venus.</i> <i>Sp !</i>
<i>lithoglypha.</i> <i>Meusch.</i>	<i>Mytilus ovalis.</i> <i>Lam.</i>
<i>nasuta.</i> <i>Phil.</i>	<i>Corbula nuciformis.</i> <i>Sow.</i>
<i>Arca umbonata.</i> <i>Lam.</i>	<i>Pinna D'Orbignyi.</i> <i>Hanley.</i>

<sup>1</sup> *Nassa ambigua* is a common West Indian shell, formerly supposed to be British.

<sup>2</sup> *Helix formosa* is said to be found only in Antigua and Barbuda; the beautiful specimen in the collection was presented by Mrs. Mends, of St. John's, Antigua.





1



2

Barbatia fusca. <i>Brug.</i>	Pecten exasperatus. <i>Sow.</i>
Acar gradata. <i>Brod.</i>	Pseudamussium argenteus. <i>Reeve.</i>
Lacina.	Rocellaria. <i>Sp.?</i>
Myrtsea scabra. <i>Lam.</i>	Isognomon serratula. <i>Reeve.</i>
Chama macropylla. <i>Chem.</i>	

## BARBUDA.

The coast of Barbuda is formed by a long and low line of drifting sands, yielding scarcely any shells except after a storm. At half a mile from the beach the depth is 15-20 fathoms, with a hard sandy bottom, from which the dredge returns with scarcely more than a handful of contents. We dredged for about two hours with small results; but a day's dredging in a little deeper water about a mile from the shore might, I think, be very successful.

### UNIVALVES.

† Sconsia Barbudensis. <sup>1</sup>	<i>Higgins and Marrat.</i> Trivia pediculus. <i>L.</i>
Spirula. <i>Sp.?</i>	[ <i>Marrat.</i> Cerithium litteratum. <i>Born.</i>
Nerita.	Cerithidea costata. <i>Lam.</i>
Pila peloronta. <i>L.</i>	ambigua. <i>O. B. Ad.</i>
tessellata. <i>Gmel.</i>	Strombus. <i>Sp.?</i> young.
Fissurella.	Murex. <i>Sp.?</i>
Lucapina Listeri. <i>D'Orb.</i>	Cassidea testiculus. <i>L.</i>
Bulla amygdalus. <i>L.</i>	† Vasum globulus. <sup>2</sup> <i>Reeve.</i>

<sup>1</sup> *Sconsia Barbudensis.* *Higgins and Marrat.* Liv. Mus. Report. No. 1, plate 1, fig. 1. Natural size. S. testa ovata, pallide fulva, castaneo longitudinaliter flammulata, transversim indistincte striata, versus labrum et varicem subdecussata; spira conica; anfractibus sex; labio cum callo tenui tecto; labro extus subincrassato, intus lirato.

Animal unknown. The shell is distinguished by the character of the genus, of which two species have been previously described. Differs from *S. striata*, *Lam.*, in the plications of the inner lip, which are confined to the anterior portion; in the transverse striations, which are even and not crenulated; and in the colour pattern, which is formed by undulating streaks of reddish-tawny colour on a paler ground. I am indebted to Mr. Edgar Smith, of the British Museum, for the knowledge of *Sconsia Grayi* (A. Adams, P.Z.S., 1854), from which shell it differs in the conical spire and flamed colour-pattern, and in the distant striations. Dredged in good condition, but without the animal, in fifteen fathoms water, off the Island of Barbuda.

<sup>2</sup> *Vasum globulus.* This shell was given to me by the Rev. J. Cowley, Incumbent of Barbuda. It differs much from the specimen figured by Reeve, but agrees well with Kiener's figure.

Conus.	Purpura patula. <i>Linn.</i>
<i>Chelyconus columba. Hwass.</i>	
Natica.	Columbella mercatoria. <i>L.</i>
<i>Mamma mamilla. L.</i>	Nitidella nitida. <i>Lam.</i>
Olivella pulchella. <i>Reeve.</i>	Dolium perdix. <i>L.</i>
<i>Guildingii. Reeve.</i>	Nassa.
Dactylus.	<i>Hima ambigua. Pult.</i>
<i>Strephona reticularis. Lam.</i>	<i>+ annellifera. Reeve.</i>
Cyprea exanthemea. <i>L.</i>	Rissoa fragilis. <i>Mich.</i>
<i>cinerea. Gmel.</i>	Drillia vexillum. <i>Reeve!</i>
	Modulus lenticularis. <i>Chem.</i>

## BIVALVES.

Ervilia nitens. <i>Mont.</i>	Lucina.
Venus. <i>Sp.!</i>	<i>Codakia tigerina. L.</i>

## ST. KITT'S.

Saw a cabinet of shells in the possession of Dr. Branch, who gave me a number of fine specimens of *Amphibulina patula*, a Succinea-like shell, supposed to be found in this island only.

## FRESH-WATER SHELLS.

Amphibulina patula. <i>Brug.</i>	Physa Cubensis. <i>Pfeiff.</i>
----------------------------------	--------------------------------

## LAND SHELLS.

Orthalicus.	Subulina octona. <i>Chem.</i>
Leptomerus Hondurasanus. <i>Pfeiff.</i>	Oleacea.
Helicina.	Electra. <i>Sp.!</i>
Pachystoma Dysoni. <i>Pfeiff.</i>	

## DOMINICA.

## UNIVALVES.

Purpura patula. <i>L.</i>	Columbella mercatoria. <i>L.</i>
<i>+ Stramonita fasciata. Reeve.</i>	Nassa.
<i>+ Cuma diadema. Lam.</i>	<i>Hima ambigua. Pult.</i>
Livona pica. <i>L.</i>	<i>Bulla amygdalus. Lister.</i>
Tectura striata. <i>Quoy. and Gaim.</i>	Dactylus.
<i>Cumingii. Reeve.</i>	<i>Strephona olivaceus. Meissch.</i>
Nerita.	Planaxis semisulcata. <i>Sow.</i>
<i>Pila striata. Martyn.</i>	Lophyrus squamosus. <i>L.</i>
<i>tessellata. Gmel.</i>	<i>assimilis. Reeve.</i>
<i>peloronta. L.</i>	<i>marmoratus. Chem.</i>
Neritella.	
<i>Vitta meleagris. Lam.</i>	

## BIVALVES.

Mytilus.	Axinsea. <i>Sp.!</i>
<i>Aulacomya exustus. Lam.</i>	

## LAND SHELLS.

Bulimulus.		Lucerna.	
† Petraeus rugatus. <i>Reeve.</i>	Dentalaria Josephinae. <i>Forus.</i>		
Guadaloupensis. <i>Brug.</i>	nigrescens. <i>Wood.</i>		
Helicina. <i>Sp.?</i>	pachygastra. <i>Gray.</i>		

## ST. VINCENT.

The harbour of Kingstown affords excellent shore collecting at low water; but, whilst wading amongst the rocks, it is well to be on the look out for the occasional influx of a wave much larger than ordinary.

## UNIVALVES.

Murex.	Columbella.
Phyllonotus oculatus. <i>Reeve.</i>	Nitidella nitida. <i>Lam.</i>
Purpura patula. <i>L.</i>	Mitrella cibaria. <i>Lam.</i>
Thalesia deltoidea. <i>Lam.</i>	Latirus. <i>Sp.?</i>
† Stramonita fasciata. <i>Reeve.</i>	Tectura candeana. <i>D'Orb.</i>
Pisania pusio. <i>L.</i>	
Tritonium tritonis. <i>L.</i>	var.
† Gutturinum cynocephalum. <i>Lam.</i>	Bulla amygdalus. <i>L.</i>
Planaxis semisulcata. <i>Sow.</i>	Emarginula.
lineata. <i>Da Costa.</i>	Subemarginula depressa. <i>Blain.</i>
Cypraea cinerea. <i>Gmel.</i>	Lucapina cancellata. <i>Soland.</i>
Trivia pediculus. <i>L.</i>	Tectarius dilatatus. <i>D'Orb.</i>
Conus.	muricatus. <i>L.</i>
Stephanoconus mus. <i>Hwass.</i>	Littorina.
Nerita.	Melaraphe zic-zac. <i>Chem.</i>
Pila peloronta. <i>L.</i>	carinifera. <i>D'Orb.</i>
albipunctata. <i>Reeve.</i>	Omphalius excavatus. <i>Lam.</i>
	Lophyrus squamosus. <i>L.</i>

## BIVALVES.

Isognomon serratula. <i>Reeve.</i>	Barbatia.
	Acar divaricata. <i>Sow.</i>

## GRENADE.

Just before leaving the Island, I made a hasty inspection of a very interesting collection of shells, formed by Mr. Rowley, a resident in Georgetown. The whole of his specimens had been collected by himself, in that most beautiful of all harbours, the Carinage.

Murex.  
Chicoreus imbricatus. *Higgins and Marrat.*

*Murex (Chicoreus) imbricatus.* *Higgins and Marrat.* Liv. Mus. report, No. 1, plate 1, fig. 2. Natural size. M. testa subelongato-

fusiformi, transversim granoso-lirata, inter varices fortiter bi vel tri-tuberculata, trifasciam varicosa, varicibus conspicue confertim frondosis, laciniate-foliois, ad apicem spinosis, incurvis laminato-squammatis; columella lœvi; aurantio lutescente, liris rufofuscis; apice rubescente.

Animal unknown. Shell differing from *M. palma-rosae*, Lam., by its rounder aperture and much more delicate growth. The fronds on the varices are finely divided, and are imbricated or squamulose to the recurved tip, which is prolonged into a pale spine. Dredged in the Carinage, Island of Grenada.

I saw, in Grenada, a series of this Murex, in the possession of Mr. Rowley, of Georgetown. The shells varied from an inch in length to the size of the specimen figured. None of them resembled any other Murex I had ever seen.

## TRINIDAD.

The great and almost land-locked harbour, the Gulf of Paria, resembles the mouth of a large river. Its shore, for many miles, is, in fact, part of the delta of the Orinoco, and its shallow waters are every where more or less turbid, whilst the bottom is formed of a soft mud, obviously deposited by the river. Dredging is quite useless except in the neighbourhood of the Bocas, or Dragon's Mouth, where a few small shells may be found. The land and fresh-water shells have been carefully collected by Mr. Guppy, a resident in Port of Spain.

### UNIVALVES.

#### Nassa.

*Phrontis antillarum.* *Phil.*

### FRESH-WATER SHELLS.

*Pomus urceus.* *Mull.*

*Marisa cornu-arietis.* *L.*

*Neritella.*

*Vitta Mertoniana.* *Recluz.*

### LAND SHELLS.

#### Bulinus.

*Plecocheilus glaber.* *Gmel.*  
*distortus.* *Brug.*

## LA GUAYRA.

### UNIVALVES.

*Antalis inversa.* *Desh.*

*Acus hastata.* *Gmel.*

*Euryta consentini.* *Phil.*

† *Ziziphinus Leanus.* *C.B. A* 4

*Nassa.*

*Hima ambigua.* *Pult.*

<i>Persicula Kieneriana.</i> <i>Petit.</i>	<i>Columbella.</i>
<i>Olivella parvula.</i> <i>Mart.</i>	<i>Nitidella lavigata</i> <i>L.</i>
<i>gracilis.</i> <i>Brod.</i> and <i>Sow.</i>	<i>Eutropia.</i>
<i>Dactylidia mutica.</i> <i>Say.</i>	<i>Tricolia.</i> <i>Sp.?</i> <i>Operculum of Senectus.</i>

## BIVALVES.

*Tivela.* *Sp.?*

The shells from La Guayra were dredged by James Woods, during my absence on land. *Persicula (Marginella) Kieneriana*, a beautiful little shell of very unusual occurrence in collections, was obtained at about half a mile N.N.W. of the anchorage. It has not been recorded from any other locality.

## VENEZUELA.

## LAND SHELLS.

*Bulimus oblongus.* *Müll.*

## CARACAS.

Presented by DR. ROJAS.

<i>Bulimus.</i>	<i>Helicina.</i>
<i>Plecocheilus euryomphalus.</i> <i>Reeve.</i>	<i>Pachystoma agglutinans.</i> <i>Sow.</i>
<i>Orthalicus.</i>	
<i>Mesembrinus spectabilis.</i> <i>Reeve.</i>	

## PUERTO CABELLO.

## UNIVALVES.

<i>Purpura patula.</i> <i>L.</i>	<i>Drillia.</i>
<i>Thalessa deltoidea.</i> <i>Lam.</i>	<i>Crassisspira.</i> <i>Sp.?</i>
† <i>Stramonita fasciata.</i> <i>Reeve.</i>	<i>Tritonium tritonis.</i> <i>L.</i>
<i>Murex recurvirostris.</i> <i>Brod.</i>	<i>Cassidulus melongena.</i> <i>L.</i>
<i>Chicoreus elongatus.</i> <i>Lam.</i>	<i>Littorina.</i>
<i>Cerithium cundatum.</i> <i>Sow.</i> <i>Sp.?</i>	<i>Melaraphe undulata.</i> <i>Lam.</i>

## BIVALVES.

<i>Arca occidentalis.</i> <i>Phil.</i>	<i>Radula.</i>
<i>Americana.</i> <i>Lam.</i>	<i>Ctenoides scabra.</i> <i>Born</i>

## TUCACAS.

Dredging at this station was very laborious, whether in the harbour or in the lagoons, which extend for many miles inland. The dredge usually came up filled with a mixture of sand and mud, requiring at

each haul, a long time and much work before it could be sufficiently washed to render the smaller shells visible. Nevertheless, the proceeds, on the whole, were interesting, though perhaps less so in shells than in various other marine productions. The Argo remained for five days at Tucacas.

## UNIVALVES.

- |   |  |
|---|--|
| <i>Cassidulus melongena.</i> <i>L.</i>        | <i>Omphalius excavatus.</i> <i>Lam.</i>          |
| <i>Purpura.</i>                               | <i>Natica Broderipiana.</i> <i>Muhl.</i>         |
| <i>Thalessa deltoidea.</i> <i>Lam.</i>        | <i>Persicula interruptolineata.</i> <i>Muhl.</i> |
| <i>Stramonita floridiana.</i> <i>Conrad.</i>  | <i>Marginella.</i>                               |
| <i>fasciata.</i> <i>Reeve.</i>                | <i>Cryptospira prunum.</i> <i>Gmel.</i>          |
| <i>Terebra.</i>                               | <i>Hondurasensis.</i> <i>Reeve.</i>              |
| <i>Myurella armillata.</i> <i>Hinds.</i>      | <i>Nassa.</i>                                    |
| <i>Nerita.</i>                                | <i>Phrontis zonalis.</i> <i>Brug.</i>            |
| <i>Pila striata.</i> <i>Martyn.</i>           | <i>Semicassis inflata.</i> <i>Shaw.</i>          |
| <i>peloronta.</i> <i>L.</i>                   | <i>Dactylus.</i>                                 |
| <i>tessellata.</i> <i>Gmel.</i>               | <i>Strephona olivaceus.</i> <i>Meusch.</i>       |
| <i>Neritella.</i>                             | <i>Porphyria scripta.</i> <i>Lam.</i>            |
| <i>Vitta Mertoniana.</i> <i>Recluz.</i>       | <i>Leptoconus proteus.</i> <i>Brug.</i>          |
| <i>Bulla amygdalum.</i> <i>List.</i>          | <i>Chelyconus pusio.</i> <i>Lam.</i>             |
| <i>Strombus gigas.</i> <i>L. with Operc.</i>  | <i>Cypræa isabella.</i> <i>L.</i>                |
| <i>Young.</i>                                 | <i>Bursa.</i>                                    |
| <i>Murex recurvirostris.</i> <i>Brod.</i>     | <i>† Lampas affinis.</i> <i>Reeve.</i>           |
| <i>Tritonium tritonis.</i> <i>L.</i>          | <i>Dentalium pseudo-sexagonum.</i> <i>Desh.</i>  |
| <i>† Gutturnium cynocephalum.</i> <i>Lam.</i> | <i>Cerithium litteratum.</i> <i>Born.</i>        |
| <i>Distorsio cancellina.</i> <i>Desh.</i>     | <i>Sp.?</i>                                      |
| <i>Modulus lenticularis.</i> <i>Chem.</i>     | <i>Littorina.</i>                                |
| <i>Livona pica.</i> <i>L.</i>                 | <i>Melaraphe zig-zac.</i> <i>Chem.</i>           |
| <i>Turritella.</i>                            | <i>columellaris.</i> <i>D'Orb.</i>               |
| <i>Haustator variegata.</i> <i>L.</i>         | <i>Tectarius muricatus.</i> <i>L.</i>            |
| <i>Drillia pallida.</i> <i>Sow.</i>           | <i>pyramidalis.</i> <i>Quoy.</i>                 |
| <i>affinis.</i> <i>Gray.</i>                  | <i>Marisa luteostoma.</i> <i>Swain.</i>          |
| <i>Bolma rugosa.</i> <i>L. var.</i>           | <i>Lophyrus squamosus.</i> <i>L.</i>             |

## BIVALVES.

- |   |   |
|---|---|
| <i>Callista dione.</i> <i>L.</i>          | <i>† Periploma inaequivalvis.</i> <i>Schum.</i> |
| <i>exspinata.</i> <i>Reeve.</i>           | <i>Leda ventricosa.</i> <i>Hinds.</i>           |
| <i>Chione cancellata.</i> <i>L.</i>       | <i>Elenensis.</i> <i>Sow.</i>                   |
| <i>Timoclea granulata.</i> <i>Gmel.</i>   | <i>Adrana tellinoides.</i> <i>Wood.</i>         |
| <i>Tivela macrota.</i> <i>Born.</i>       | <i>Thracia plicata.</i> <i>Desh.</i>            |
| <i>young.</i>                             | <i>Tellina.</i>                                 |
| <i>Lævicardium serratum.</i> <i>L.</i>    | <i>Tellinella pulchella.</i> <i>Lam.</i>        |
| <i>vitellinum.</i> <i>Reeve.</i>          | <i>Angulus similis.</i> <i>Sow.</i>             |
| <i>Cardium.</i>                           | <i>Strigilla piciformis.</i> <i>L.</i>          |
| <i>Trachycardium muricatum.</i> <i>L.</i> | <i>Sp.?</i>                                     |
| <i>Siliquaria gibba.</i> <i>Spong.</i>    | <i>Vola aspersa.</i> <i>Sow.</i>                |
| <i>Lucina.</i>                            | <i>Standella.</i>                               |
| <i>Codakia tigerina.</i> <i>L.</i>        | <i>Merope Senegalensis.</i> <i>Phil.</i>        |
| <i>pecten.</i> <i>Lam.</i>                | <i>Spisula corbuloides.</i> <i>Desh.</i>        |
| <i>Myrtea muricata.</i> <i>Spong.</i>     |   |

<i>Donax denticulatus.</i> <i>L.</i>	<i>Corbula crassa.</i> <i>Hinds.</i>
<i>Scapharca ovata.</i> <i>Reeve.</i>	<i>Cubaniana.</i> <i>D'Orb.</i>
<i>compacta.</i> <i>Reeve.</i>	
† <i>nux.</i> <i>Sow.</i>	<i>Anatina.</i> <i>Sp.?</i>

## SANTA MARTA.

## UNIVALVES.

<i>Bulla nebulosa.</i> <i>Gould.</i>	<i>Marginella.</i>
<i>Bohra rugosa.</i> <i>L. var.</i>	<i>Cryptospira marginata.</i> <i>Born.</i>
<i>Natica canrena.</i> <i>L.</i>	<i>Emarginula.</i>
<i>Turritella.</i>	<i>Subemarginula octoradiata.</i> <i>Gmel.</i>
<i>Haustator variegata.</i> <i>L.</i>	<i>Uvanilla brevispina.</i> <i>Lam.</i>
<i>Latirus infundibulum.</i> <i>Gmel.</i>	<i>Architeconica granulata.</i> <i>Lam.</i>
<i>Purpura patula.</i> <i>L.</i>	<i>Persicula interrupto-lineata.</i> <i>Muhl.</i>
<i>Thalessa deltoidea.</i> <i>Lam.</i>	<i>Scala.</i>
<i>Sp.?</i>	<i>Clathrus clathrus.</i> <i>L.</i>
<i>Stramonita fasciata.</i> <i>Reeve.</i>	<i>Leptoconus.</i>
<i>Nerita.</i>	<i>Chelyconus pusio.</i> <i>Brug.</i>
<i>Pila striata.</i> <i>Martyn.</i>	<i>Strombus tubercularis.</i> <i>Lam.</i>
<i>tessellata.</i> <i>var.</i>	with operculum.
<i>Neritella.</i>	<i>young.</i>
<i>Vitta Mertoneana.</i> <i>Risso.</i>	<i>Mazza scolymus.</i> <i>Gmel.</i>
<i>Murex recurvirostris.</i> <i>Brod.</i>	with operculum.
<i>Chicoreus megacerus.</i> <i>Sow.</i>	<i>Dactylus.</i>
<i>Mamma.</i> <i>Sp.?</i>	† <i>Strephona oblonga.</i> <i>Marrat.</i>
<i>Cerithium litteratum.</i> <i>Born.</i>	<i>olivaceus.</i> <i>Meusch.</i>
<i>Littorina.</i>	† <i>Tectura aspera.</i> <i>Lam.</i>
<i>Melaraphe carinifera.</i> <i>D'Orb.</i>	

## BIVALVES.

<i>Perna tulipa.</i> <i>Lam.</i>	<i>Donax denticulatus.</i> <i>L.</i>
<i>Cardium.</i>	† <i>Heterodonax ovulinus.</i> <i>Desh.</i>
<i>Trachycardium subelongatum.</i> <i>Sow.</i>	<i>Anomalocardia antiquata.</i> <i>L.</i>
<i>Isocardia isocardia.</i> <i>L.</i>	<i>Chione.</i>
<i>Hemicardia.</i>	<i>Circomphalus paphia.</i> <i>L.</i>
<i>Fragum media.</i> <i>L.</i>	<i>Venus crenulata.</i> <i>Chem.</i>
	<i>Pinna pernula.</i> <i>Chem.</i>

The Argo remained a few hours only at Santa Marta. I saw *Mazza scolymus* taken by a man who waded in the bay where the water was up to his chest, and felt for the shells with his feet. He was hunting for the *Mazza*, which he knew to be a less common shell. At length I saw him duck for his prize, which he brought on shore with great expectations. The beautiful Olive *Strephona oblonga*, *Marrat*, was brought for sale in large numbers. The animal is of a mottled colour, not unlike the shell, but with more of purple.

## POINT SAVANILLA.

## UNIVALVES.

Purpura.	Columbella mercatoria. <i>L.</i>
Stramonita fasciata. <i>Reeve, var.</i>	Mitrella cribaria. <i>Lam.</i>
Thalessa deltoidea. <i>Lam.</i>	Cerithium Eriense. <i>Val.</i>
† Latirus angulifera. <i>Lam.</i>	Fissurella.
Tritonium.	Cremides Barbadensis. <i>Gmel.</i>
Simpulum. <i>Sp.?</i>	Conus.
Gutturnium tuberosum. <i>Lam.</i>	Stephanoconus mus. <i>Hwass.</i>
Livona pica. <i>L.</i>	Siphonaria palpebram. <i>Reeve.</i>
Nerita.	Bulinus? <i>Guadaloupensis. Brug.</i>
Pila peloronta. <i>L.</i>	
tessellata. <i>Gmel.</i>	

## BIVALVES.

Isognomon serratula. <i>Reeve.</i>	Cardium.
	Isocardia isocardia. <i>L.</i>

## CARTAGENA.

Here, as elsewhere, *Strombus gigas*, *L.*, abounded; but the specimens here brought on board had on the columella a wondrous golden sheen, which, however, soon disappeared. The animals were very strong, and, after lying awhile on deck, would protrude themselves as far as possible from the shell, which they would fling over with great vigour. Their eyes were bright and well formed, but had a most sinister aspect.

## HAVANA.

## UNIVALVES.

Murex recurvirostris. <i>Brod.</i>	Neritella.
Tritonium.	Vitta pupa. <i>Lam.</i>
Gutturnium tuberosum. <i>Lam.</i>	meleagris. <i>Lam.</i>
Cantharus.	Conus.
Tritonidea proteus. <i>Reeve.</i>	Stephanoconus mus. <i>Hwass.</i>
† Loroisi. <i>Petit.</i>	Pentadactylus.
Lithopoma tuber. <i>L. var., spined.</i>	Sistrum anaxares. <i>Duclos.</i>
Nerita.	Sp.?
Pila peloronta. <i>L.</i>	Columbella mercatoria. <i>L.</i>
striata. <i>Chem.</i>	Mitrella cribaria. <i>Lam.</i>
Littorina.	Nassa.
Melaraphe guttata. <i>Phil.</i>	Phrontis zonalis. <i>Brug.</i>
Sp.?	Fissurella.
zic-zac. <i>Chem.</i>	Cremides Barbadensis. <i>Gmel.</i>
Tectarius dilatata. <i>D'Orb.</i>	Tectura leucopleura. <i>Gmel.</i>
Bulla amygdalus. <i>List.</i>	Crypta.
	Crepipatella aculeata. <i>Chem.</i>

## BIVALVES.

<i>Venus cancellata.</i> <i>L.</i>	<i>† Anomalocardia nux.</i> <i>Sow.?</i>
<i>Chione.</i>	<i>Mytilus.</i>
<i>Circomphalus paphia.</i> <i>L.</i>	<i>Aulacomya exustus.</i> <i>Lam.</i>
<i>Asaphus deflorata.</i> <i>L. var.</i>	<i>Chama macrophylla.</i> <i>Chem.</i>
<i>Isognomon serratum.</i> <i>Reeve.</i>	<i>Lucina.</i>
<i>Tellina.</i>	<i>Mytila muricata.</i> <i>Chem.</i>
<i>Tellinella lineata.</i> <i>Turton.</i>	
<i>Angulus similis.</i> <i>Sow.</i>	

*Presented by the HAVANA MUSEUM.*

<i>Eurycratera.</i>	<i>Cochlea imperator.</i> <i>Montf.</i>
<i>Polymita picta</i>	<i>Lucerna.</i>
<i>Helicina.</i>	<i>Serpentulus sagemon.</i> <i>Beck.</i>
<i>Emoda titanica.</i> <i>Poey.</i>	

## VERA CRUZ.

## UNIVALVES.

<i>Semicassis inflatus.</i> <i>Shaw.</i>	<i>Nerita.</i>
<i>Conus.</i>	<i>Pila striata.</i> <i>Martyn.</i>
<i>Stephanoconus mus.</i> <i>Hwass.</i>	<i>Nassa.</i>
<i>Tritonium.</i>	<i>Hima ambigua.</i> <i>M.</i>
<i>Simpulum pileare.</i> <i>L.</i>	<i>Littorina.</i>
<i>Latirus.</i>	<i>Melaraphe columellaris.</i> <i>D'Orb.</i>
<i>Mitra.</i>	<i>Cerithium.</i> <i>Sp.?</i>
<i>Scabricola granulosa.</i> <i>Brug.</i>	<i>Janthina globosa.</i> <i>Swain.</i>
<i>Purpura.</i>	<i>exigua.</i> <i>Lam.</i>
<i>Thalessa deltoidea.</i> <i>Lam.</i>	<i>Fissurella Hondurasensis.</i> <i>Reeve.</i>
<i>Sp.?</i>	<i>Lucapina cancellata.</i> <i>Soland.</i>
<i>† Stramonita fasciata.</i> <i>Reeve.</i>	<i>Ampullaria Linnaei.</i> <i>Phil.</i>
<i>Mamma.</i> <i>Sp.?</i>	<i>Planorbis.</i> <i>Sp.?</i>
<i>Ruma mamillaris.</i> <i>Born.</i>	

## BIVALVES.

<i>Mytilus.</i>	<i>Perna tulipa.</i> <i>Lam</i>
<i>Aulacomya hamatus.</i> <i>Say.</i>	

## NASSAU.

This being our last station for marine collecting, on our arrival I lost no time in engaging a boat for the period of our visit. Dredging and shore collecting were prosecuted vigorously for four days, in all suitable directions. We took with us one or two divers to dive for coral, and to bring large stones from below low-water mark, to be examined for limpets, chitons, &c. A general account of our proceedings and collecting grounds will be found in "Notes of the Argo Expedition," read before the Liverpool Naturalists' Field Club, 1876-7.

## UNIVALVES.

- Columbella mercatoria.* *L.*  
*Nitidella nitida.* *Lam.*  
*Fissurella Hondurasensis.* *Reeve.*  
*Cremides Barbaden sis.* *Gmel.*  
*Lucapina cancellata.* *Soland.*  
*viridula.* *Lam.*  
*Clypidella fascicularia.* *Lam.*  
*Tectura cimelita.* *Reeve.*  
*leucopleura.* *Gmel.*  
*† Siphonaria cochleariformis.* *Reeve.*  
*Obeliscus terebellum.* *Mull.*  
*Terebra.*  
*Myurella larvaformia.* *Hinds.*  
*Acus hastata.* *Gmel.*  
*Melampus coffeus.* *L.*  
*Tralia pusilla.* *Gmel.*  
*Littorina.*  
*Melaraphe columellaris.* *D'Orb.*  
*carinifera.* *Mde.*  
*var.*  
*Tectarinus muricatus.* *L.*  
*dilatatus.* *D'Orb.*  
*† Antonii.* *Phil.*  
*Cerithium eburneum.* *Brug.*  
*graciliforme.* *Sow.*  
*litteratum.* *Born.*  
*variabile.* *C. B. Ad.*  
*Doli um perdx.* *L.*  
*Vermetus lumbicalis.* *L.*  
*Cassis Madagascariensis.* *Lam.*  
*flammea.* *L.*  
*tuberosa.* *L.*  
*Cassidea testiculus.* *L.*  
*Tritonium variegatum.* *L.*  
*Gutturnium antillarum.* *D'Orb.*  
*Epidromus.* *Sp.!*  
*Pericula guttata.* *Link.*  
*Purpura patula.* *L.*  
*Thalessa deltoidea.* *Lam.*  
*var.*  
*† Stramonita fasciata.* *Reeve.*
- Drillia.*  
*† Crassispira fucata.* *Reeve.*  
*Conus.*  
*Stephanoconus mus.* *Hrass.*  
*nebulosus.* *Solard*  
*verrucosus.* *Hrass.*  
*Leptococonus flavescentes.* *Gray*  
*Livona pica.* *L.*  
*Cyphoma gibbosa.<sup>1</sup>* *L.*  
*Nassa.*  
*† Hima obtusata.* *A. Ad.*  
*Bulla amygdalus.* *List.*  
*† Cuma diadema.* *Lam.*  
*Strombus accipitrinus.* *Mart.*  
*Turritella.* *Sp.!*  
*Scala.*  
*Clathrus clathrus.* *L.*  
*Gibbula dentata.* *L.*  
*Astronium longispinum.* *Lam.*  
*Omphalius scalaris.* *Anton.*  
*Senectus Menkeana.* *Gmel.*  
*Fasciolaria tulipa.* *L.*  
*Rissoina Bryerii.* *Mtg.*  
*Morum oniscus.* *L.*  
*Natica marochiensis.* *Reduz.*  
*Cyprea exanthema.* *L.*  
*cinerea.* *Gmel.*  
*Luponia spurca.* *L.*  
*Trivia pediculus.* *L.*  
*var. dark red.*  
*Dactylus.*  
*Strephona olivacea.* *Mousch.*  
*Olivella pellucida.* *Reeve.*  
*Nerita.*  
*Pila peloronta.* *L.*  
*striata.* *Martyn.*  
*tessellata.* *var.*  
*Volva subrostrata.<sup>2</sup>* *Sow.*

<sup>1</sup> The animal of *Cyphoma gibbosa* does not seem to have been known to Messrs. H. and A. Adams. The shell, when the animal is feeding, is entirely covered by the mantle margin, which is of a bright buff colour, sprinkled with delicate coffee-coloured rings. These shells are collected and sold for use as shirt-studs.

<sup>2</sup> *Volva subrostrata* feeds on the branches of *Rhipidigorgia*, Sea-fans. On the common lilac Sea-fan the animal and its shell were lilac; on the yellow variety of the same *Gorgonia*, not only the animal, but also the substance of the shell, was of a yellow colour.

## BIVALVES.

Perna tulipa.	Lam.	Tellina.
Barbatia fusca	Brug.	Tellinella Antonii. Phil.
Arca tetragona.	Poli.	Venus. Sp.?
Leucocardium serratum.	L. var.	Isognomon serratula. Reeve.
Papyridae.		Lucina aurantia. Desh.
Fulvia bullata.	L. young.	Codakia pecten. Lam.
Avicula ala-perdiciois.	Reeve.	Vola aspersa. Sow.
Mytilus.		Chama reflexa. Reeve.
Aulacomya exustus.	Lam.	Radula lima. L.
Asaphis deflorata.	L.	Axinea.
		Pectunculus pecteniformis. Gmel.

## LONG KEY ISLAND.

## UNIVALVES.

Purpura patula.	L.	Tectura cimelita. Reeve.
Thalessa deltoidea.	Lam.	leucopleura. Gmel.
† Stramonita fasciata.	Reeve.	Emarginula.
Burea.		Subemarginula depressa. Blainv.
† Lampas rhodostoma.	Beek.	Fissurella.
Livona pica.	L.	Cremides Barbadensis. Gmel.
Gibbula dentata.	L.	Lucapina cancellata. Soland.
Ruma mammillaris.	Born.	viridula. Lam.
Littorina.		Clypidella fascicularis. Lam.
Melarasphe zic-zac.	Chem.	Periscula guttata. Link.
Tectarius muricatus.	L.	Nassa.
† Antonii.	Phil.	† Uzita obtusata. A. Ad.
dilatata.	D'Orb.	Columbella mercatoria. L.
Nerita.		Turris. Sp.?
Pila peloronta.	L.	Cerithium eburneum. Brug.
striata.	Martyn.	litteratum. Born.
tessellata.	Gmel.	Cladopoda. Sp.?
Neritella.		Pupa mumia. Brug.
Vitta pupa	L.	Cyphoma gibbosa. L.
Tritonium.		
Gutturnium tuberosum.	Lam.	

## BIVALVES.

Barbatia fusca.	Brug.	Mytilus.
Arca. Sp.?		Aulacomya exusta. Lam.

## ATHOL ISLAND.

## UNIVALVES.

Purpura.		Mamma. Sp.?
Thalessa deltoidea.	Lam.	Drillia.
Sp.?		Crassispira fucata. Reeve.

<i>Senectus Malkeanus.</i> <i>Gmel.</i>	<i>Cerithium litteratum.</i> <i>Born.</i>
<i>Nerita.</i>	<i>eburneum.</i> <i>Brug.</i>
<i>Pila striata.</i> <i>Martyn.</i>	<i>Modulus.</i> <i>Sp.?</i>
<i>Neritella.</i>	<i>Littorina.</i>
<i>Vitta Mertoniana.</i> <i>Recluz,</i> 4 vars.	<i>Melaraphe carinifera.</i> <i>D'Orb.</i>
<i>Gibbula dentata.</i> <i>L.</i>	<i>Tectarius muricatus.</i> <i>L.</i>
<i>Nassa.</i>	<i>dilatatus.</i> <i>D'Orb.</i>
<i>Hima obtusata.</i> <i>A. Ad.</i>	<i>Pupa marmorata.</i> <i>Pr.</i>
<i>ambigua.</i> <i>Pult.</i>	

## BIVALVES.

*Lævicardium serratum.* *L.*

## ABACO.

## UNIVALVES.

<i>Lophyrus squamosus.</i> <i>L.</i>	<i>Columbella mercatoria.</i> <i>L.</i>
<i>foveolatus.</i> <i>Poli.</i>	<i>Nitidella nitida.</i> <i>Lam.</i>
<i>assimilis.</i> <i>Reeve.</i>	<i>Mitrella cribaria.</i> <i>Lam.</i>
<i>Conus.</i>	<i>Morum oniscus.</i> <i>L.</i>
<i>Stephanoconus mus.</i> <i>Hwass.</i>	† <i>Siphonaria cochleariformis.</i> <i>Reeve.</i>
<i>verrucosus.</i> <i>Hwass</i>	<i>Emarginula.</i>
<i>Leptoconus flavescentis.</i> <i>Gray</i>	<i>Subemarginula depressa.</i> <i>Blain.</i>
<i>Tritonium.</i> <i>Sp.?</i>	<i>polygonata.</i> <i>Ad.</i>
<i>Mitra granulosa.</i> <i>Lam.</i>	<i>Haminea.</i> <i>Sp.?</i>
<i>Dactylus.</i>	<i>Calyptula alveolata.</i> <i>A. Ad.</i>
<i>Strephona olivaceus.</i> <i>Meusoh.</i>	<i>Cochloepas imbricata.</i> <i>Gould.</i>
<i>Olivella parvula.</i> <i>Martini.</i>	<i>Nassa.</i>
<i>oryza.</i> <i>Lam.</i>	<i>Hima.</i> <i>Sp.?</i>
<i>Omphalius excavatus.</i> <i>Lam.</i>	<i>Acus hastata.</i> <i>Gmel.</i>
<i>maculo-striatus.</i> <i>C. B. Ad.</i>	<i>Cladopoda arenaria.</i> <i>Quoy.</i>
<i>scalaris.</i> <i>Anton.</i>	<i>Vermetus lumbicalis.</i> <i>L.</i>
<i>Gibbula dentata.</i> <i>L.</i>	<i>Scala.</i>
<i>Volvaria.</i>	<i>Clathrus clathrus.</i> <i>L.</i>
<i>Volvarina subtriplicata.</i> <i>D'Orb. var.</i>	<i>Cerithium ferrugineum.</i> <i>Say.</i>
<i>Mamma mammilla.</i> <i>L.</i>	<i>Littorina.</i>
<i>Natica.</i>	<i>Melaraphe carinata.</i> <i>D'Orb.</i>
<i>Stigmaulax sulcata.</i> <i>Born.</i>	<i>Volva subrostrata.</i> <i>Sow.</i>
<i>Obeliscus terebellum.</i> <i>Mull.</i>	<i>Planaxis lineata.</i> <i>Da Costa.</i>
<i>Trivia pediculus.</i> <i>L.</i>	<i>Tectarius dilatata.</i> <i>D'Orb.</i>
<i>quadripunctata.</i> <i>Gray.</i>	<i>Livona pica.</i> <i>L. var.</i>
<i>Leucozonia Knori.</i> <i>Desh.</i>	<i>Cantharus.</i>
<i>Fissurella.</i>	<i>Tritonidea ringens.</i> <i>Reeve.</i>
<i>Cremides Barbadensis.</i> <i>Gmel.</i>	<i>Neritella.</i>
<i>rugosa.</i> <i>Sow.</i>	<i>Vitta pupa.</i> <i>L.</i>
<i>nodosa.</i> <i>Born.</i>	<i>Nerita.</i>
<i>clathrata.</i> <i>Reeve.</i>	<i>Pila peloronta.</i> <i>L.</i>
<i>Lucapina cancellata.</i> <i>Soland.</i>	<i>striata.</i> <i>Martyn.</i>
<i>suffusa.</i> <i>Reeve.</i>	<i>tessellata.</i> <i>Gmel.</i>
<i>minuta.</i> <i>Sow.</i>	<i>Purpura.</i>
<i>viridula.</i> <i>Lam.</i>	<i>Thalessa deltoidea.</i> <i>Lam.</i>

*Clypidella fascicularis.* *Lam*  
*Tectura cimelita.* *Reeve.*  
 leucopleura. *Gmel.*  
 melanoleuca. *Gmel.*

*Stramonita.* *Sp.?*

*Eurycratera.*  
*Polymita varians.* *Menke.*

*Cyclostomus Dominicensis.* *Pfeiff.*  
*Pupa mumia.* *Brug.*

#### LAND SHELLS.

*Barbatia fusca.* *Brug.*  
*Acar gradata.* *Brod.*  
*Axinea.* *Young.*  
*Chione pygmæa.* *Lam.*  
*Avicula assula.* *Reeve.*  
*Pecten.*  
*Chlamys ornatus.* *Lam.*  
*Isognomon serratula.* *Reeve.*  
*Ostrea foliacea.* *L.*

*Asaphis deflorata.* *L.*  
*Tellina radiata.* *L.*  
*Radula lima.* *L.*  
*Hemicardia.*  
*Fragum media.* *L.*  
*Perna.*  
*Brachydontes subramosa.* *Han.*  
*Lucina aurantia.* *Desh.*  
*Cyclus divaricata.* *L.*

The shells from Abaco were chiefly collected from flat blocks of coral debris, brought to shore from water two or three feet in depth.

SHELLS, presented by F. H. REDFIELD, Esq., Philadelphia.

*Erato vitellinus.* *Hinds.*

*Eurycratera*  
*Polymita Brocheri.* *Gut.*

#### CONCLUDING REMARKS.

Occasionally the same species may be found recorded in several of the lists; for the occurrence of a species in several distinct, though neighbouring, localities, may be a fact at least as suggestive as the finding of a fresh species.

It will be observed how very much the shells of the older conchologists preponderate in the lists.

The foregoing series is simply a small contribution to the materials requisite for the construction of a scheme which shall include the chief facts of the distribution of the West Indian Mollusca. From such a scheme, when it shall be completed, interesting conclusions may, no doubt, be drawn.

LIVERPOOL:  
D. MARPLES AND CO., LIMITED,  
LORD STREET.



G

